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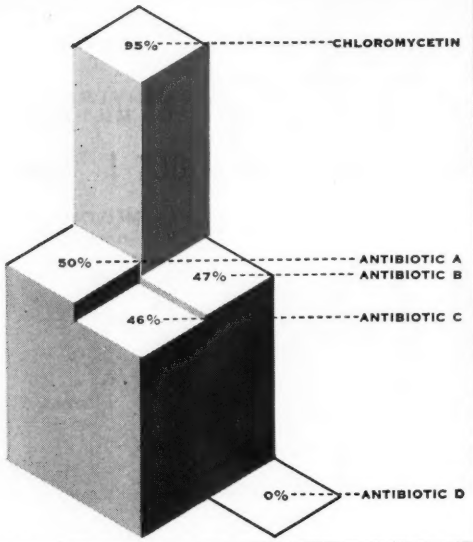

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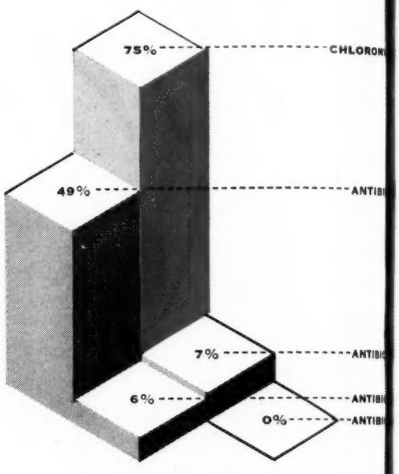

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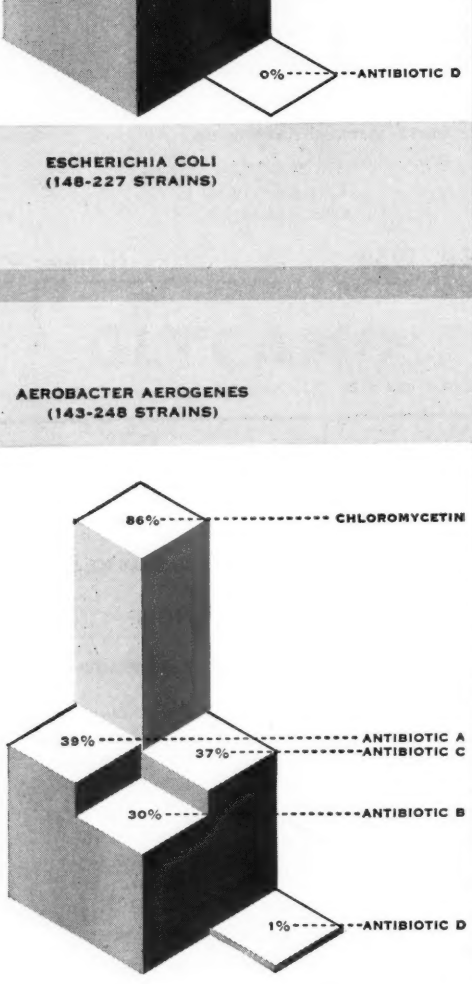

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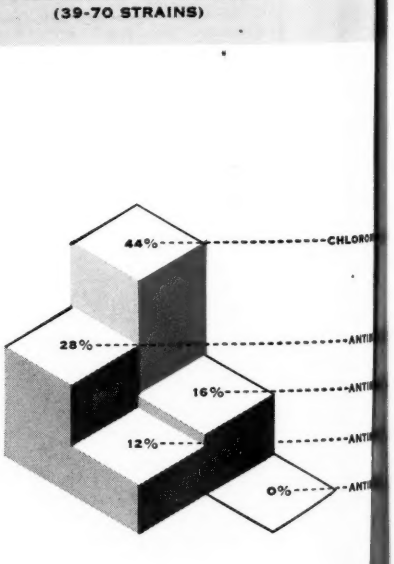

*This graph, based on in
is adapted from Horton

Original Contributions

Metabolic Relationships of Potassium, Nitrogen and Sodium

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Chicago, Illinois

AN adequate consideration of the metabolic activities of any one of the three elements comprising the title of this discourse would obviously require more time than that allotted for the present Arthur H. Sanford Memorial Lecture. The inclusion of all three of them, therefore, may merely represent a case of poor judgment. Nevertheless, the attempt will be made to outline, even though briefly, some of the more important relationships of these elements, with particular emphasis upon a few aspects of special clinical concern at the present time.

Let us first consider a few significant facts about potassium. As Fenn has said,[1] "Potassium is remarkable as the only ion of physiological importance which has a naturally occurring radioactive isotope, K^{40}. This isotope further on disintegration gives off beta rays and turns into calcium or gives off gamma rays and a positron and turns into argon. From the amounts of these substances the original amount of K^{40} can be calculated, as well as the age of the earth. With the original amount present there was enough heat from the higher rate of disintegration to keep the earth in a fluid state. Thus potassium is responsible for the formation of its own physiological antagonist, calcium, and has played an important role in the geological history of the earth. Potassium is also remarkable as the essential intracellular ion. As such the exchangeable potassium of the soil is essential currency for the growth of plants, and high potassium foods are essential for the growth of animals." Potassium is also known to be indispensable for muscle contraction, including cardiac muscle, for nerve action, for glycogen formation, and for certain intracellular enzymatic actions concerned with energy release. For example, phosphocreatine in muscle exists as a di-potassium salt, thus evidencing the relationship of potassium to the formation and function of the high-energy phosphate bonds which are so important in cellular metabolism. It has been estimated from balance studies that in a healthy adult human subject the daily turnover of potassium is about one gram, and that, on the average, the potassium content of all tissues is about 150 grams, of which approximately 115 grams are in muscle, 8 grams in the blood, 4 grams in the skin, 3 grams in the extracellular fluid, and only about 300 milligrams in the circulating plasma.

Since the development of the flame photometer increasing numbers of clinical conditions have been shown to be associated with hypokalemia, and potassium deficiency has become a dominant problem in many clinical situations. Thus in a survey of more than a thousand patients in which the plasma potassium levels were obtained, Ellison and associates[2] found abnormally low levels in approximately 20 per cent, with about 6 per cent showing values below 3 mEq/L., most of the latter in surgical patients. Danowski[3] has recently outlined the usual ways in which hypokalemia develops, viz.: (1) From increase by dilution of the extracellular fluid volume; (2) from transfer of potassium from the extracellular fluid to cells; and (3) from the loss of potassium from both cells and extracellular fluid. In the first category, hypokalemia may result from a too-copious administration of potassium-free fluids, with a consequent imbalance of potassium ion between cells and tissue fluids. Such a dilution type of hypokalemia can be prevented by limitation of water intake or by the use of better balanced fluids for hydration purposes. Hypokalemia may also result from the migration of potassium ions from extracellular fluid into cells, as, for example, under anabolic conditions of cellular growth and repair, during the use of testosterone, from dehy-

From the Department of Pathology, University of Chicago, Chicago, Illinois.
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dration, acidosis, familial periodic paralysis, or from excessive use of glucose solutions and insulin, with a resulting increased formation of glycogen. Probably the most common causes of hypokalemia, and of potassium deficiency in general, however, are attributable to external losses of potassium ion, as from starvation, dehydration, alkalosis, diarrhea, vomiting, suction drainage, fistulas, burns, radiation effects, deglycogenation, tissue anoxia, administration of adrenocortical steriods, cortical tumors (aldosteronism), et cetera.

The pathologic consequences of potassium loss are varied. The predominant effects are usually manifested in relation to muscle action, particularly in muscles of the intestinal, respiratory and cardiac systems. Thus such symptoms as weakness, lassitude and lethargy, intestinal distention, and respiratory difficulties may be conspicuous enough to demand immediate attention. Probably of more ultimate importance, however, is the loss of potassium from heart muscle. This may lead to cardiac dilatation, hypotension, ectopic rhythms, fibrillation, or tachycardia. Recently attention has been paid, also, to the effects of potassium loss from cardiac muscle in increasing the sensitivity of the heart to digitalis, thereby inducing or augmenting digitalis toxicity.[4] Dramatic therapeutic effects have been observed under such conditions from the use of potassium salts. These findings are merely a further demonstration of the biologic importance of potassium ion in myocardial functioning and a further indication of the need for more information about the mechanisms of action of potassium and other ions, particularly sodium, in the heart itself.

Experimental studies in animals deprived of potassium have repeatedly demonstrated the vital importance of potassium ion in relation to heart function. This has been shown in several species. In the rat, the production of potassium deficiency by the use of diets low in potassium, or by the injection of desoxycorticosterone acetate, leads to the development of focal necroses of the myocardium. We have produced such lesions by subjecting protein-depleted rats to protein repletion by the feeding of diets devoid of potassium.[5] Within two or three weeks many of the animals die, and at autopsy the conspicuous findings are massive cardiac necroses, extreme congestion and edema of the lungs, and signs of generalized passive hyperemia. One explanation of these pathologic changes is that in the course of nutritional repletion, as body mass and blood volume increase, with a concomitant increase in the cardiac work-load, the absence of dietary potassium leads to acute potassium deficiency in the heart itself, and areas of cardiac muscle undergo coagulation necrosis reminiscent of a myocardial infarct, although of course induced in a different way. Moreover, these necroses are related importantly to sodium ion, as evidenced by the fact that their development can be prevented if repletion is accomplished by feeding diets devoid of both potassium and sodium ions. The point to be emphasized here, however, is the importance of both ions in heart functioning and the need to recognize this in relation to potassium deficiency states, to post-surgical management, and particularly to congestive heart failure.

A second important metabolic aspect of potassium is its relationship to nitrogen. For example, since the early experiments of Benedict[6] it has been known that in a fasting human subject the ratio of urinary nitrogen to potassium is approximately ten to one. This is likewise the ratio of the two elements in normal muscle. It seems reasonable to suppose, therefore, that in severe catabolic processes there must be a steady loss from muscle of both nitrogen and potassium. It seems reasonable to assume, moreover, that in the processes of convalescence, these two elements must re-enter regenerating muscle in similar proportions; and since potassium is an indispensable ion for tissue reconstruction, it must be made nutritionally available. This presents a particularly interesting problem in parenteral feeding, especially in relation to the use of potassium-poor plasma, and it has become evident that potassium must be supplied in order for the metabolic utilization of plasma to be effective. This raises an additional question about the intracellular utilization of potassium in relation to catabolism in general. Currently there is a growing tendency to use potassium salts freely in therapy, regardless of the general metabolic state of the patient. What does this mean from the standpoint of the metabolic results to be achieved?

Metabolic experiments in man, by Howard and Bigham,[7] and by Albright and Reifenstein,[8] have indicated that nitrogen and potassium generally follow parallel courses of excretion, tending to move together in and out of cells in a fixed relationship to one another. In severe catabolism,

therefore, if both nitrogen and potassium are leaving the body in considerable amounts in the urine, one may wonder whether potassium administered at such a time will be able to enter and remain in cells which are themselves steadily losing potassium. Is it possible that the administered potassium merely joins that being poured out into the urine? It is of course probable that extracellular potassium has important functions and that, even during severe catabolism, not every cell in the body is equally affected. Therefore, under unusually adverse catabolic conditions some cells presumably can utilize potassium ions to some degree.

In attempting to find answers to these questions we have studied the problem experimentally in normal and in protein-depleted rats subjected to varying periods of positive and negative nitrogen and potassium balances. Our general scheme was to examine quantitatively the relationships of anabolism and catabolism with respect to the tissue utilization of potassium. We wished to know (1) to what extent protein-depleted animals can undergo effective protein repletion and retain administered potassium while ingesting rations containing or lacking nitrogen, and (2) the interrelationships of nitrogen and potassium in normal animals similarly treated. Such studies can be made reasonably precise because the nitrogenous needs of the animals can be met by the feeding of appropriate mixtures of amino acids; and the animals can be thrown into acute catabolism merely by the omission from the diet of one essential amino acid, as, for example, tryptophan. Thus their ability to retain potassium can be determined in relation to their general metabolic states as evidenced by positive or negative nitrogen balances.

These experiments demonstrated that the parenteral administration of potassium salts while the animals were in negative nitrogen balance failed to establish positive potassium balances until the nitrogen balances had also become positive as a result of the feeding of adequate amino acid mixtures. Furthermore, the omission of one essential amino acid from the ration led to a negative nitrogen balance and a concomitant negative potassium balance despite the continued administration of potassium salts.

The results suggest the following conclusions: The problem of correction of a potassium balance is more complicated than simply that of the administration of potassium salt alone. On the contrary, the experiments indicate that the metabolic state of the tissues themselves largely determines their capacity to retain and to utilize potassium ion. For optimal nutritional replenishment of depleted tissues both nitrogen and potassium are essential, and probably in definite relationships to one another. In nutritional repletion, presumably, the tissue need is for both elements; and if losses of both are going on concurrently, the need for both would seem to be particularly critical. If this reasoning is correct, the basic nutritional problem would seem to be the re-establishment of the anabolic state. Once this has been accomplished, potassium utilization by cells should quickly follow.

Having said this, however, it is obvious that the solution of the problem is far from easy, and doubtless there are numerous metabolic situations as, for example, in post-surgical catabolic states, after severe burns, after radiation injury, et cetera, where the conversion from catabolism to anabolism appears to be well-nigh impossible. Nevertheless, rather than yielding to the point of view that catabolic processes are at times inevitable, it would seem all the more important to recognize the problem as clearly as possible because in many instances it may be possible at least to minimize the adverse effects of tissue losses of important constituents. It is possible, therefore, that despite the many years of study which have been devoted to it, the single most important metabolic problem may still be that of nitrogen balance. If and when that problem is solved, potassium utilization should automatically fit into its proper place in the reconstruction processes as well as in those of tissue maintenance.

The final phase of this presentation deals with the relationship of sodium to potassium. Here a reciprocal relationship has long been evident. It is now known, also, that although sodium ions function most prominently in the extracellular fluid, they may enter cells and at times exert a harmful effect.[9] For example, accumulating evidence indicates that whereas potassium ions activate certain important enzyme systems, sodium ions inhibit these same reactions. Under what conditions, therefore, may imbalances of these two cations have clinical significance?

It is generally assumed, mainly as a result of studies of electrolyte exchange in muscle, that as potassium ions diffuse from a cell, sodium ions

tend to enter it and "replace" them. It is also assumed that normally there is an intracellular mechanism, termed the "sodium pump," which acts continuously to drive out the sodium ions which have entered the cell. When the homeostatic mechanisms governing the process fail, however, sodium ions may accumulate within the cell, thereby forcing out potassium ions; this process is referred to as "displacement." It is also possible that when sodium ions in the extracellular fluid considerably outnumber potassium ions, the sodium ions might competitively hinder the entrance of potassium ions into the cell. This possibility might be thought of as "ionic interference."

Although the evidence for replacement of potassium ions by sodium ions is better than is that for displacement or for ionic interference, the latter processes may conceivably operate, as, for example, in congestive heart failure, renal failure, toxemia of pregnancy, eclampsia, or because of excessive action of adrenal mineralocorticoids, such as in primary aldosteronism, all of which are associated with excessive bodily retentions of sodium. Under such conditions, displacements of potassium by sodium might lead to cellular damage, especially in respiratory or cardiac muscle.

In studying this problem we have fed growing rats diets low in potassium but excessively high in sodium over periods as long as fifty-three weeks. Under such conditions the animals grew reasonably well, during which time they gradually lost potassium; and, in those eating the higher amounts of sodium chloride, myocardial necroses characteristic of potassium deficiency developed. Balance studies and carcass analyses indicated a bodily loss of potassium and a gain of sodium. Does this mean that the high intake of sodium led to the cellular displacement of potassium?

No final answer can as yet be given because of the fact that the polydipsia and polyuria induced by the high-salt intake may have promoted a steady loss of potassium through the kidneys. Arguing against this, however, are the observations of Seldin and Tarail[10] that in human subjects in whom diuresis was produced by the ingestion of large amounts of water or by the administration of solutions of glucose or mannitol, there was no increased excretion of potassium in the urine during the period of diuresis. We have observed a similar effect in young rats fed basal diets containing identical amounts of potassium but with either high-sodium or low-sodium content. Concomitantly, the amino acid and fluid intakes were equalized by supplying the animals with a potassium-poor solution of fibrin-hydrolysate (aminosol), so diluted as to force the animals to drink considerable amounts daily. Potassium-balance studies demonstrated a markedly lower retention of potassium in the animals on the high-salt intake, suggesting that the potassium loss through the kidneys was not the result of high fluid intake alone.

In conclusion, this discussion may be summarized as follows: In the course of metabolism during which cellular activities are constantly being influenced by a variety of homeostatic mechanisms concerned with the control of the internal environment, the elements potassium, sodium and nitrogen are intimately interrelated in their passages into and out of cells. Under pathologic conditions, however, as, for example, in the presence of deficits or excesses of one or more of these elements in the tissue fluids or cells, imbalances may occur. The correction of these imbalances by homeostatic readjustments represents the essential problem of nutritional, fluid and electrolyte management. It is gratifying that, since the mechanisms controlling these interactions are becoming better understood, therapeutic management is becoming correspondingly effective.

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The Present Status of the Seroflocculation Reaction

HARRY S. PENN, M.D.,
Los Angeles, California

IN this presentation I shall take you on an adventure of an idea. I shall introduce a new approach (at least it was new some twenty-five years ago) to the cancer problem. I shall discuss the various means employed which tended to substantiate, at least in a measure, the validity of this concept. I shall also try to show that the seroflocculation reaction may prove to be an object of research of interesting and important heuristic value, as well as an important laboratory aid in the serodiagnosis of cancer.

During the last twenty-five years, we have been witnessing a distinct change in the field of cancer research. Classic theories have somehow gradually disintegrated under the attack of critical inquiry. New ideas as to the causation of cancer, many of them quite contradictory, have entered the arena and are fighting for recognition. They range from ideas based on purely philosophical speculations to those based on highly complicated physicochemical processes.

The Cohnheim theory postulating the origin of cancer from embryonic rest cells has been finally refuted.[1] The virus parasitic theory is another approach to carcinogenesis. Thus far, however, attempts to link the tumor-causing virus to mammalian malignancies (leukemia in mice as a probable exception) lack confirmation.[2] Views of more recent origin are based on a firmer foundation.

Haddow[3] contends that "the mechanism which permits unlimited growth must clearly reside in the cell itself. That it may reside partly at least in the cytoplasm is obviously a possibility for future investigations, both by cytological methods and by experiments."

The discovery of the milk factor by Bittner[4,5] is unquestionably of momentous importance. It opens new vistas for cancer research, and offers a more intimate insight of carcinogenesis.

In this seemingly chaotic state, it is difficult as yet to discern which of these concepts will emerge as the one destined to gain an enduring place in our views of the cancer problem.

In a publication about twenty years ago, as the result of some years of clinical and experimental investigations, I advanced the hypothesis that many forms of cancer may be the result of an endogenous carcinogen which may originate from cholesterol or its decomposition products,[6] and that such products being foreign to the organism may possess or acquire antigenic properties.[7] Following the first publication, it was gratifying to note that similar views were later expressed by other investigators, such as Fieser,[8] Greenstein[9] and Boyland.[10]

To quote a more recent one, Willis[11] is of the opinion that "not only has experimental work disclosed a great variety of exogenous carcinogenesis, but it has shown also that endogenous carcinogens may be formed in the body itself as a result of disturbed hormonal states, or other pathological conditions."

But what about the actual existence of the predicted endogenous carcinogen?

The answer soon came from the classic work of Kleinenberg, Neufach and Shabad[12,13] showing that the unsaponifiable fraction obtained from human cancerous livers, and, to some extent, noncancerous livers, possesses carcinogenic properties. The confirmatory evidence subsequently presented by Menke,[14] Aptekman,[15] Des Ligneris,[16] and Hieger,[17] and the extensive investigations carried out by Steiner,[18] left little doubt that fatty components of cancer origin, when injected into animals, will produce malignant neoplasms.

A number of other investigations, some of them still unpublished, were carried out in our labora-

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The C. M. Jackson Lecture given before the Phi Beta Pi fraternity at the University of Minnesota, February 16, 1956.

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tory to test the validity of the endogenous carcinogen concept.

It was assumed that the presence of such a carcinogen in the circulation would necessarily be in very small quantities. If only means could be found to identify its presence! An interesting experiment by Hieger[19] furnished the necessary link. He has shown that the fluorescence of a solution of most of the polycylic carcinogenic hydrocarbons, such as 20-methylcholanthrene, 1-2-5-6-dibenzathracene, when subjected to the excitation by ultraviolet light, will produce on the spectrographic plate three characteristic bands in the region of 4000-4400 Å.

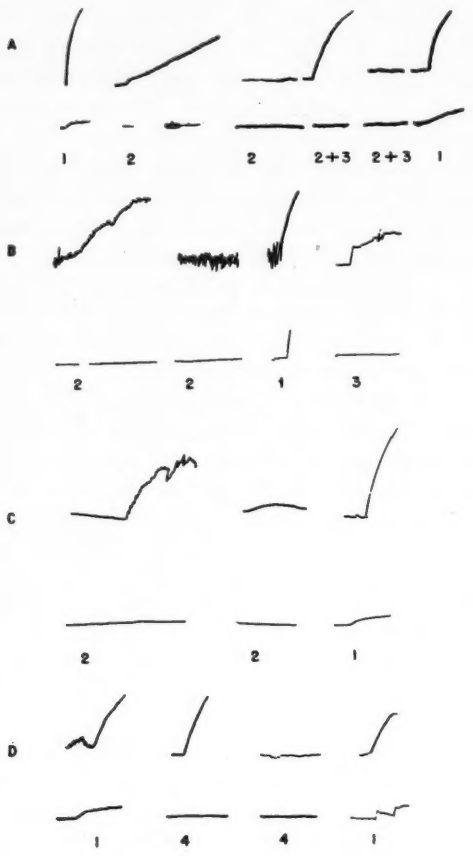

Fig. 1. *A* shows that independent reactions can be elicited when the sensitized gut is challenged by either the lipid alone or lipid and horse serum mixture.

B illustrates that the guinea pig can be passively sensitized with rabbit antiserum prepared against Ca.T.L. with horse serum. To determine whether or not horse serum was indispensable in the process of immunization, an antiserum against Ca.T.L. was produced under aseptic precautions without horse serum.

C This animal was sensitized to Ca.T.L. without Schlepper. The specific response obtained is evident that antibody against Ca.T.L. alone can be produced in the guinea pig.

D shows a guinea pig passively sensitized with a rabbit antiserum produced against the cancerous non-saponifiable fraction without horse serum. It demonstrates that the cancerous non-saponifiable component is likewise antigenic when tested under conditions described for *C*.

Key to figures in legends:

1=Histamine
2=Acetone soluble lipid obtained from human cancerous livers (Ca.T.L.)
3=Horse Serum (H.S.)
4=The non-saponifiable component (Ca.N.S.) obtained from Ca.T.L.

This technique offered an opportunity to examine some very small quantities of material. The liver being the principal organ of steroid metabolism, and since the nonsaponifiable fraction has been shown to possess carcinogenic properties, this organ was chosen for source material. Cancerous livers were hydrolyzed, the nonsaponifiable fraction isolated, dissolved in petroleum ether, and chromatographed on a silicic acid column. The ethanol extracted material of the lower zone on the column, when subjected to Hieger's technique, gave a three-banded structure almost identical with the one produced by methylcholanthrene. This formation was found to be absent in the similarly prepared nonsaponifiable fraction obtained from noncancerous livers. This investigation was carried out in collaboration with Dr. Joseph Kaplan, Professor of Physics, University of California, at Los Angeles, and Dr. Sidney Rubens.[20]

Concurrently, the possible antigenicity of the carcinogenic nonsaponifiable fraction was investigated. The experiments were confined primarily to the Schultz-Dale reactions on a series of guinea pigs sensitized with the acetone soluble fatty component as well as with the nonsaponifiable fraction, with and without a "Schlepper." The animals produced characteristic specific responses to the nonsaponifiable fraction as well as to the foreign proteins employed (Fig. 1). The introduction of lipoid material into the muscle-bath, however, produced an emulsion and slowed the contractable response. To secure additional evidence that these reactions were truly specific, guinea pigs were passively sensitized by injecting them with rabbit antiserum prepared against the cancerous and noncancerous acetone soluble lipid, and its nonsaponifiable components. It appears that guinea pigs can be rendered sensitive to the crude total lipoid component when this is injected with or without horse serum.

Reverse Passive Sensitization

In order to extend information concerning lipoid antigenicity and to facilitate the testing of materials of weak immunizing capacities, cross reactions of the several lipoid derivatives were studied by means of reverse passive anaphylaxis.

Previous experience has shown that intravenous injection of the necessary volume of lipid would frequently result in fatalities because of pulmonary embolism. To avoid this complication, a different maneuver to insure proper distribution and dilution of the antigen had to be employed. First antisera were produced against all lipids employed. The lipids were emulsified with normal guinea pig serum and administered to the test animals via the carotid artery in the following manner:

The carotid artery was exposed under ether anesthesia, the test antigen instilled intra-arterially, the vessel ligated, and the wound closed. The animals were allowed to recover, permitted to survive for periods ranging from five to 180 minutes, and then sacrificed and prepared in the usual manner. The results of tests performed with the reverse passive technique will be fully reported in a subsequent publication. For the present purpose of establishing evidence of antigenicity, a few of the records are presented (Fig. 2).

According to evidence secured from the Schultz-Dale experiments, there can be little doubt re-

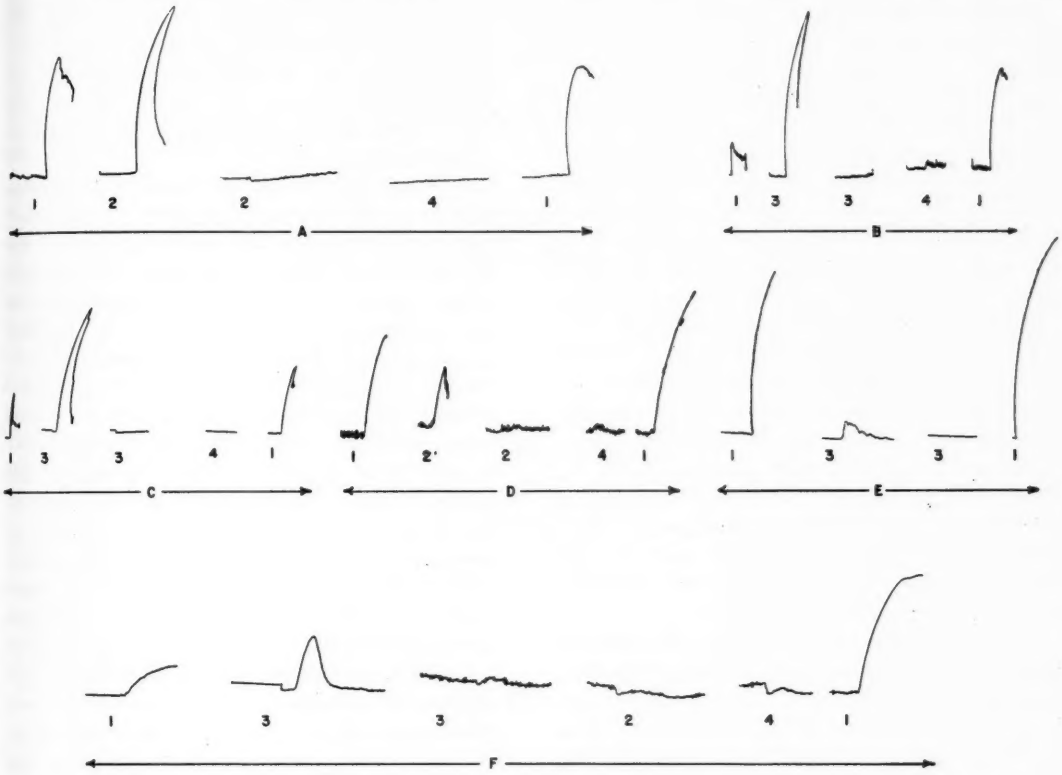

Fig. 2. *A* shows a specific sensitization of the animal to cancerous total lipid (Ca.T.L.) antiserum after three hours' incubation.
B shows a cross reaction with antiserum to non-cancerous total lipid (N.T.L.) after three-hours' incubation.
C. Same as *B*.
D shows that the animal reacted to rabbit antiserum against cancerous total lipid (Ca.T.L.) but not against normal rabbit serum. In this animal, incubation interval lasted only five minutes.
E, a different strip of the same gut as in *D*, shows cross reaction with non-cancerous total lipid (N.T.L.) antiserum. The reaction is somewhat weaker than the previous homologous response.
F, animal incubated for three hours, shows that a previous exposure to non-cancerous total lipid (N.T.L.) antiserum abolished the response to the homologous Ca.T.L. antiserum.

Key to figures in legend:
1=Histamine
2=Cancerous Total Lipid (Ca.T.L.) antiserum
3=Normal Total Lipid (N.T.L.) antiserum
4=Normal Rabbit Serum (N.R.S.)

garding the fact that lipoid extractives can be antigenic. We have shown that the method used to prepare serologically active lipids[21] can also produce materials capable of sensitizing guinea pigs and immunizing rabbits and, further, that the antibody produced in rabbits can be passively transferred to guinea pigs.

Because of the difficulty of absorbing antisera with lipids, we have thus far been unable to eliminate cross reactions with lipids obtained from noncancerous livers. Hence, the question of the identity or difference among antigens found in cancerous and noncancerous livers is still moot. Recent developments, however, indicate that such differentiation may be possible. Results of this investigation will be published at a later date.

In addition, rabbits injected under aseptic conditions with an acetone soluble lipoid component without "Schlepper," obtained from either cancerous or noncancerous livers, produced antisera giving definite seroflocculation reactions consistent with a characteristic antibody complex. Sera of rabbits bearing the Brown-Pearce tumor were found to give positive seroflocculation reaction when mixed with the human nonsaponifiable liver antigen. Conversely, the nonsaponifiable component obtained from Brown-Pearce tumor gave a positive reaction when mixed with the serum of cancer-bearing patients.

The above reactions were found to be negative when the lipoid antigens were obtained from noncancerous source material. This may be strongly indicative of the presence of a common, but not necessarily identical, component present in the human cancerous tissue as well as in the Brown-Pearce tumor.

In the light of the above findings, one could hardly escape the logical conclusion that the existence of the hypothetical endogenous carcinogen may be further substantiated by demonstrating a corresponding antibody to the nonsaponifiable component obtained from cancerous livers in the serum of a cancer-bearing patient.

This approach presented a number of formidable difficulties. First, since the unsaponifiable fraction was never before employed as an "antigen," there was no previous literature to which to refer. Second, the number of variables, such as saline concentration, pH, amount of cholesterol, amount of serum, the dilution of the antigen, and a number of other factors, required almost endless determinations, the total of which reached astronomical figures.

The results of the original liver "antigen" obtained from cancer-bearing patients showed 80 to 81 per cent specificity when tested against the sera of patients with known histologically proven malignancy. Following a refinement of this material, the specificity increased to over 90 per cent.[7]

At present the "antigen" obtained from the livers of patients who died of cancer is under investigation by Dr. Richard F. Riley in our department. His efforts are directed toward the identification of the serologically active component or components.

Further study of the seroflocculation reaction brought to light the fact that while the "positive" reactions, percentagewise, were greatest in the sera of cancer-bearing individuals, it was also found "positive" in the sera of persons having other pathologic conditions. The phenomenon then posed a series of challenging problems.

It was very important, for instance, to determine whether the seroflocculation reaction is a true antigen-antibody complex. Should it prove to be so, what is its meaning? What is its role in the scheme of human metabolism? Are we generating antibodies to certain lipids in response to stress, such as trauma? Are some individuals under these conditions more responsive than others? And, most important, does the cancerous process evoke a specific antibody?

In order to gain further insight into the significance of this phenomenon, it was soon realized that because of the relative scarcity of cancerous livers, the limited quantity of the final fraction obtained was insufficient for our investigations. It was, therefore, pertinent to inquire whether other compounds more readily available would manifest similar seroflocculation attributes and lend themselves as satisfactory substitutes.

Following the original postulate that the hypothetical carcinogen may arise from normal steroids; and since the bile acids are normal steroid constituents, it was desirable to ascertain whether or not a dehydration product of desoxycholic acid would produce a serologically active compound if the conversion were carried out at body temperature. Subsequent experiences seemed to justify this expectation.

Details of the procedure were recently reported.[22] Briefly stated, desoxycholic acid was treated with refrigerated concentrated sulphuric acid under controlled conditions at a temperature range between 38 to 40°C. The serologically active ma-

terial was obtained by chromatographic separation on activated alumina. This was later identified by Dr. Haagen-Smit, Professor of Organic Chemistry, California Institute of Technology, as chiefly, the ethyl ester of choladienic acid. Dr. Haagen-Smit subsequently produced this compound in crystalline form.

It should be evident from the preceding that the impelling force motivating these investigations was the desire to find supporting evidence for a given concept. At no time was I prompted to search for a "test" for cancer.

As it may be expected, the liver nonsaponifiable material as a derivative of tumor tissue or cancerous livers has given more accurate information than the ethyl ester of choladienic acid. For it is obvious that the metabolic processes of animals, including humans, are incapable of producing this compound similarly to the rigorous laboratory conditions. Even the very existence of this compound in the animal organism is questionable. The seroflocculation phenomenon, therefore, in the case of the bile acid derivative, is at best a cross reaction and the results, naturally, must be interpreted with greater caution.

Now let us examine the seroflocculation reaction as to the extent of its usefulness as a laboratory aid in cancer detection. During the years, a considerable number of cancer tests based on serologic abnormalities were reported. Since time and space would not permit enumeration of them all, we shall confine ourselves to the most promising few.

Winzler and Burk[23] found increased mucopolysaccharides in cancer sera. An increase was also noted in many other pathologic conditions. Black's[24,25] methylene blue test, consisting of boiling patient's serum with methylene blue, showed, it was claimed, a difference between cancer and normal sera. This manifestation is due to a decrease of reducing substances in the serum as well as a decreased thermal coagulation capacity. Huggins'[26] test is based on the findings that the serum from a cancer-bearing individual requires less iodoacetate to prevent coagulation when heated to 100°C. than serum from normal individuals.

The seroflocculation reaction is carried out by mixing the serum of the cancer-bearing patient with "antigen" (either the cancerous liver nonsaponifiable fraction or the bile acid derivative) under controlled conditions. The suspension is agitated in a Kahn shaker for three minutes and centrifuged for ten minutes. The tubes are then "flipped" and examined. The finding of discrete particles floating in a clear medium is interpreted as a "positive" reaction. A turbid suspension, or particles floating in a turbid medium, is interpreted as a "negative" response. In the former we presume we are dealing with an antigen-antibody complex.

It is not the objective of this presentation to evaluate the comparative merits of the seroflocculation reaction with the tests previously mentioned, but rather to emphasize the marked difference between this phenomenon and the changes manifested by the other tests. In those tests we are dealing with an increase or a decrease of normally occurring components. In the seroflocculation reaction, on the other hand, we are dealing with what has thus far been indicated, although not conclusively proven, to be a new serum protein produced by invasive cancer and to some extent by other pathologic states.

Now we come to the problem of serodiagnosis of cancer, but before entering into this discussion it is important to clarify in our minds at what stage of development of this complex manifestation we term malignancy a serologic test should be "positive." A critical examination of the cancerous process both on the experimental and clinical level may shed some light on the question.

When a minimal dose of a potent carcinogen, such as methylcholanthrene, is applied to the skin of a mouse, nothing may happen until another application of an irritant, such as croton oil,[27] is made. Only then certain changes take place, such as thickening of the skin with subsequent formation of papillomata which eventually, in many cases, become malignant.

The second medication has been termed a co carcinogen. On the basis of this and many other analogous experiments, a theory of a two-stage mechanism of the causation of cancer has been advanced. First, where a strong carcinogen in minimal dosage or a weak carcinogen in a higher dosage acts upon a group of susceptible cells producing an irreversible damage, such groups of cells are called latent or dormant cancer cells. It is postulated that at some future date an irritant, or any other "trigger" mechanism, may act on this damaged area and by so doing eventually complete the cancerous process. A similar situation is frequently encountered clinically.

At what stage of tumor development is it de-

sirable to have a "positive" test for malignancy? In the light of the experiments just mentioned, it is quite conceivable that many of us may be harboring throughout our body clumps of cells which from a histologic standpoint could be termed the dormant malignant cells. If a test so sensitive and refined would record such a condition, its impracticability is quite obvious.

When we speak of a mechanism to demonstrate the presence or absence of malignancy serologically, it stands to reason that before any such demonstrable factor can manifest itself, certain changes have to take place in the serum proper. It is conceivable that such changes in the serum can be produced by an endogenous carcinogen sufficiently potent either quantitatively or qualitatively to bring about an active invasive process, and that the corresponding changes must be specific for malignancy. Unfortunately, however, thus far no such specificity has been demonstrated conclusively in human sera. To what extent, then, can the utility of the seroflocculation reaction be employed to advantage as a laboratory aid in cancer diagnosis?

In our series of 763 cases, we found that it will give over 90 per cent correct diagnoses of histologically proven malignancies. The diagnostic value falls sharply in cases of non-invasive malignancies, such as tumors *in situ* or small (1 cm. or less) tumors of the skin and breast.[28] The reason for the difference is not clear. The seroflocculation reaction will be positive in cases of trauma, such as postoperative conditions, and in many other active pathologic conditions with a temperature of 101°F. or over.

As to these false positives, we have definite indications that most of them can be eliminated by a slight modification of the procedure. We hope to publish shortly details of the modified technique. In any case, a thorough physical examination will usually disclose the probable cause of the positive reaction.

The seroflocculation reaction may also serve as an indicator in postoperative and postradiologic treatment. In a number of instances when the patients could be followed, it was found that a "positive" serum preoperatively changed to a "negative" following complete extirpation of the malignancy.

In conclusion, I should like to state most emphatically that the seroflocculation reaction *in its present stage of development* is not a specific test for cancer. The test, if you care to call it so, may serve as an important laboratory aid to diagnosis within the framework of its limitations. The mechanism of this particular seroflocculation reaction is yet to be determined.

It is my sincere hope to stimulate a greater interest by those in their respective fields of steroid chemistry, immunochemistry, intermediary metabolism, et cetera, so that they will devote some of their time and efforts to investigate and evaluate the significance of this interesting phenomenon.

Acknowledgment

I wish to take this opportunity to express my sincere thanks to Dr. George Feigen, Assistant Professor of Physiology, Stanford University, for his guidance and co-operation in carrying out the Schultz-Dale reactions.

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Resectional Surgery for Pulmonary Tuberculosis

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RESECTIONAL surgery for pulmonary tuberculosis is an established and accepted therapeutic procedure. It is the purpose of this paper to summarize the experiences and results of such therapy in a general hospital with a special tuberculosis division (Ancker Hospital, St. Paul).

The indications for resectional pulmonary surgery used at Ancker Hospital are much the same as the indications used at other institutions.[1,2] Thoracoplasty failure, lower lobe disease, bronchostenosis, and associated bronchiectasis are all indications for resection. Furthermore, all cavitary lesions and all nodules larger than one centimeter are resected. In general, any extensive process that appears resectable in a fair to good risk patient is considered to be an indication for resection. Inadequate cardiorespiratory reserve has been the main contraindication to pulmonary resection. Age alone has not limited the use of surgery. Before resectional surgery is performed, a plateau of benefit from bed rest and chemotherapy is obtained. This usually takes from five to nine months.

Clinical Material

Between January of 1948 and July of 1955, 238 consecutive patients with pulmonary tuberculosis have undergone 269 pulmonary resections. These cases form the basis of this report.

Age, Race, and Sex.—A total of 129 women and 109 men comprise the series. This ratio of women to men of 1.18 to 1.0, is in accord with other reported series[3,4].

The age range of the patients is four to sixty-eight years. As illustrated in Table I, forty-four patients were under twenty years of age and forty-six patients were over fifty years of age. The average age was 36.8 years and the median age was 36.0 years. The average age of the men was eight years greater than that of the women, pointing out again that tuberculosis is becoming a disease of older men. All but twenty-three patients were of the Caucasian race.

Stage and Extent of Disease.—Far advanced tuberculosis was present in 48.8 per cent of the patients, moderately advanced disease in 39.9 per cent and minimal disease was present in only 11.3 per cent of the patients, using the standards of the National Tuberculosis Association (1950).

Nearly one-half (48.8 per cent) of the patients had bilateral disease. Unilateral disease was equally divided between the right and left sides.

Surgical Procedures.—We agree with Schlosser[5] that any residual caseous disease is a definite threat to the patient's future health, hence, the aim of resectional surgery at Ancker Hospital has been to remove as much of the disease process as possible and yet not leave the patient a respiratory cripple. In order to accomplish this end, pneumonectomy has been performed in thirteen patients, an incidence of 4.8 per cent of all the resections; lobectomy has been used eighty-two times for an incidence of 30.5 per cent, and segmental resection has been used 137 times for an incidence of 50.9 per cent. Minor resections such as subsegmental resections, open and closed wedge resections, and nodulectomies were performed in thirty-seven cases, 13.8 per cent of all resections.

Thoracoplasty has been used only as an adjunct to resection and it is considered a safe procedure to perform the thoracoplasty and the resection at the same time in selected patients[6]. Thoracoplasty was necessary in seven of the thirteen cases of pneumonectomy (54 per cent). Only thirty-six (30.5 per cent) of the patients undergoing lobectomy required a thoracoplasty, whereas nine (6.5 per cent) of segmental resections required a thoracoplasty.

From Ancker Hospital, Saint Paul, and the Department of Surgery, University of Minnesota Medical School.

The frequency of the various resections is illustrated in Table II.

Deaths

During the first postoperative month seventeen deaths occurred, an operative mortality of 6.3 per cent. Two additional deaths are recorded during the later period of postoperative hospitalization, for an total over-all operative mortality of 7.1 per cent. This is equivalent of 7.9 per cent over-all patient mortality. The average age of the patient that expired was 45.8 years compared with 36.8 years for the entire series. Nearly two-thirds (63.2 per cent) of the deaths were among men, whereas the men comprised only 45.8 per cent of the entire series. We have found as have others[5] that the death rate varies nearly directly with the stage of the disease, the extent of the disease process, and the extent of the resection. These facts are illustrated in Tables II, III, and IV. The age of the patient had little significance upon the mortality in patients over the age of thirty as shown in Table V.

Respiratory complications have been the leading immediate cause of death at Ancker Hospital as noted in Table VI. Bronchopneumonia was the cause of death in three patients, massive atelectasis in two patients, and unlisted respiratory

TABLE I. AGE AND SEX DISTRIBUTION OF PATIENTS UNDERGOING RESECTIONAL SURGERY FOR PULMONARY TUBERCULOSIS AT ANCKER HOSPITAL

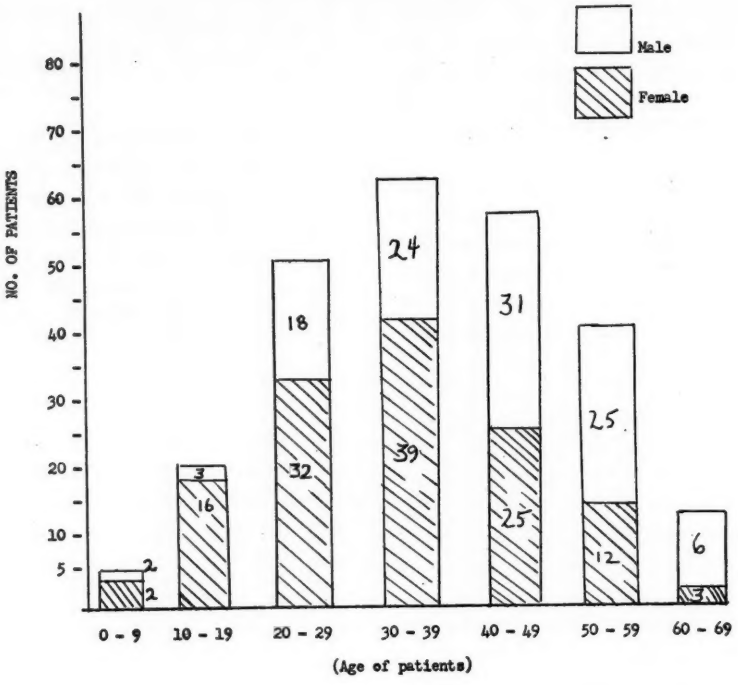

TABLE II. RELATION OF EXTENT OF THE PULMONARY RESECTION TO THE MORTALITY RATE

Extent of Resection	Number of Resections	Per Cent Total Resections	Deaths	Mortality of the Operative Procedure	Per Cent of Entire Operative Mortality
Pneumonectomy	13	4.8%	3	23.0%	1.1%
Lobectomy	82	30.5%	11	13.4%	4.1%
Segmental Resection	137	50.9%	4	2.9%	1.5%
Minor Resections	37	13.8%	1	2.7%	0.4%
Totals	269	100.0%	19		7.1%

TABLE III. RELATION OF STAGE OF DISEASE TO MORTALITY RATE

	No. Patients	No. of Deaths	Mortality
Far advanced disease	116	17	14.6%
Mod. advanced disease	95	2	2.1%
Minimal disease	27	0	0.0%
Total	238	19	7.9%

TABLE IV. RELATION OF EXTENT OF THE TUBERCULOSIS TO THE MORTALITY RATE

	No. Patients	No. Deaths	Patients Mortality
Bilateral disease	116	15	12.9%
Unilateral disease	122	4	3.2%
Totals	238	19	7.9%

TABLE V.

Age of Patients	No. Patients	No. Deaths	Mortality Rate
0-19 yrs.	23	0	0.0%
20-29 yrs.	50	1	2.0%
30-39 yrs.	63	6	9.5%
40-49 yrs.	56	6	10.7%
50-59 yrs.	37	5	13.5%
60-69 yrs.	9	1	11.1%

TABLE VI. CAUSES OF DEATH IN PATIENTS WHO HAD RESECTIONAL PULMONARY SURGERY FOR TUBERCULOSIS AT ANCKER HOSPITAL

Respiratory deaths		11
Bronchopneumonia	3	
Atelectasis	2	
Unlisted (no autopsy)	6	
Congestive heart failure		2
Pulmonary embolism		2
Coronary occlusion		2
Cardiac arrest		1
Glomerulonephritis and diabetes		1
Total		19

disease in six cases. These later patients did not have postmortem examinations.

Pulmonary embolism, congestive heart failure, and acute coronary occlusion each caused two deaths. One patient died of cardiac arrest in the operating room and one patient died of acute glomerulonephritis complicated by severe diabetes.

Aggravating causes of death include diabetes mellitus in three patients, central nervous system syphilis and acute pancreatitis in one patient each. A bronchopleural fistula was present in one patient who died with respiratory complications.

Complications

Bronchopleural Fistula.—All persistent air leaks with or without fluid that were present for more than two weeks in the immediate postoperative period (in spite of repeated tappings or tube drainage) have been considered as bronchopleural fistulas.

A total of twelve patients developed a bronchopleural fistula. This is a patient incidence of 5.0 per cent or an operative incidence of 4.5 per cent. It was noted at Ancker Hospital as elsewhere[4] that a bronchopleural fistula is more apt to develop in patients who are slightly older than the average age and have bilateral or far advanced disease. The average age of the patients who developed bronchopleural fistula was 45.7 years compared with 36.8 years for the entire series. Bilateral disease was present in 83 per cent of patients with a bronchopleural fistula whereas only 48.8 per cent of the entire series had as widespread involvement. Likewise a large portion (75 per cent) of the patients developing a bronchopleural fistula had far advanced disease in contrast to the 48.8 per cent of the entire group.

All of the twelve patients who developed a bronchopleural fistula had been bacteriologically negative for at least three months before surgery and had received an average of 11.7 months of preoperative chemotherapy. It is interesting that 66 per cent of these patients had palpable disease left behind at the time of surgery. No correlation was noted in comparing the incidence of bronchopleural fistula with positive smears or cultures of the surgical specimen. It would appear from our findings that the incidence of bronchopleural fistula is not related to the presence or absence of demonstrable tubercle bacilli in the preoperative sputum or the surgical specimen. The problem does not appear to be a matter of type of closure of the bronchial stump as the incidence has been nearly the same for a variety of surgeons employing somewhat different techniques. Insasmuch as bronchopleural fistulas more commonly followed segmental resections (8.5 per cent) than lobectomies (3.6 per cent, it would appear that the severance of intersegmental and interlobar bronchi may be of importance.

The ultimate fate of our patients with a postoperative bronchopleural fistula has not been as discouraging as in other series.[4,7] A survey of the twelve patients with bronchopleural fistula reveals that one bronchopleural fistula closed

spontaneously after twelve months of bed rest and chemotherapy. Surgical closure of the fistula was performed in four patients. The surgery consisted of further resections in three patients and simple primary closure of the defect in one case. The remaining cases had closed thoracotomy tube drainage with or without thoracoplasty. Only one death occurred among patients with bronchopleural fistula, and that occurred in a patient with severe congestive heart failure.

Spread of Pulmonary Tuberculosis During the Immediate Postoperative Period.—Any x-ray evidence of an infiltrative process during the postoperative period is considered a spread of the disease. Likewise the finding of a positive sputum or gastric washing is considered a spread of the tuberculosis. A total of thirty-five patients (13.0 per cent) fell into these catagories.

Three cases had only x-ray evidence of spread. These three patients had undergone segmental resection for unilateral disease and had received an average of seventeen months of preoperative bed rest and chemotherapy, and had had negative bacteriological studies for at least four months before surgery. Two were treated by further resection and one by bed rest and chemotherapy only. The spread was confined to the operated side in all three cases. This type of spread was limited to women of an average age of nineteen years.

A total of thirty-two patients had positive gastric or sputum bacteriological studies for the tubercle bacillus during the postoperative period. None of these had x-ray evidence of spread. The tuberculosis was considered far advanced in 69 per cent of these patients compared with 48.8 per cent of the entire series. Likewise 59 per cent had bilateral disease compared with 48.8 per cent for the entire series. Of these thirty-two patients eight had positive bacteriological examinations at the time of surgery. The remaining twenty-four patients had had negative bacteriological findings for an average of 5.6 months preoperative and received an average of seventeen months of chemotherapy.

Among the thirty-two patients who had positive bacteriological studies during the postoperative period, six developed bronchopleural fistula and have been included in the paragraph of discussion on bronchopleural fistula. One of these patients was treated by primary closure of the bronchopleural fistula, three by further resections, one patient by open drainage. One patient's fistula closed spontaneously while the patient was receiving chemotherapy and being kept at bed rest.

One of the patients with postoperative positive bacteriological examinations developed an empyema following a lobectomy. The empyema was treated by close drainage, and at a later date the patient underwent a further resection for removal of disease left behind at the original surgery. She died of respiratory failure following this second surgery.

One patient who had postoperative positive bacteriological studies received multiple aspirations of serous fluid from the thoracic cavity.

The twenty-four remaining patients all were treated with bed rest and chemotherapy. Of these twenty-four all but two had only one positive gastric or sputum examination. All patients who had evidence of spread have been able to be discharged with their disease in an arrested state.

Empyema without Evidence of Bronchopleural Fistula.—Four patients developed postoperative empyema without evidence of a bronchopleural fistula, an operative incidence of 1.4 per cent. Three had undergone segmental resection and one a lobectomy. Two of these cases were treated by repeated aspirations and two were treated by closed tube drainage.

Miscellaneous Complications. — Miscellaneous complications are recorded on fifty-one patients' medical records, (18.4 per cent incidence). These include cardiac arrest occurring twice in one patient who survived, four major wound infections, and three subscapular infections following "tailoring" thoracoplasties. In one patient the tip of a rubber catheter drainage tube broke off in the intrapleural space while the tube was being removed. Postoperative atelectasis was diagnosed in thirty-two cases. In two cases the atelectasis was massive and was considered to be the primary cause of the patient's death. The rest were treated by bronchoscopic aspiration under direct vision. Minor air leaks requiring only needle aspiration were found in fourteen patients. Eleven patients had intrapleural fluid that required aspiration. One patient survived a postoperative pulmonary embolism.

TABLE VII. FOLLOW-UP STUDIES

Surgery too recent for evaluation	27
Died at home of diabetes	1
Lost to follow-up	38
Followed 6 months to 5 years since discharge	172
Total	238
Bacteriological follow-up after discharge	
No spread or no positive bacteriologic finding	168
Single positive gastric	3
Spread	1
Total	172
Activity follow-up following discharge	
Full-time work	98
Part-time work	28
Ambulatory only	12
Hospitalized tbc	1
Hospitalized non-tbc	1
Not known	32
Total	172

Follow-up Studies

Physical examinations and bacteriological follow-up studies after the patient's discharge have varied some, due to the fact that several different physicians in private practice as well as the Ancker Hospital Out-Patient Department have been responsible for the patients' care since their discharge. In general, examinations are conducted at two-month to six-month intervals for two to three years and then at yearly intervals.

Of the 238 patients in the entire series, twenty seven have had operation too recently to be included in this follow-up series, one patient died at home from complications of diabetes and thirty-eight have been lost to the follow-up. A total of 172 patients have been followed between six months and five years since their discharge from the hospital, and form the basis of the following study as illustrated in Table VII.

Among the 172 followed, there has been only one case of proven active tuberculosis in the entire follow-up series. This occurred in a man subjected to a pneumonectomy. He left the hospital ten times against medical advice during his postoperative course and at the present time is hospitalized with cavitary lesions in his remaining lung.

Three patients had a single gastric aspiration that was found to be positive for acid fast bacilli. These were verified by guinea pig innoculations; however, no further positive bacteriological studies have been found over a period of two years, and the patient's disease is considered arrested.

The remaining 168 cases or 98.8 per cent of those followed have had no evidence of tubercle bacilli in studies of the sputum or gastric aspirations. There is likewise no roentgenographic evidence of spread in the same number of cases.

The ability of a patient to resume physical activity or employment is an excellent gauge of the results of any form of therapy. In this series ninety-eight (56.4 per cent) of the 172 patients followed have been able to resume full-time employment or engage in activities equal to their activities prior to their illness. Part-time employment or activities less than those before surgery are carried out by twenty-eight (16.5 per cent) patients. Only twelve patients are reported ambulatory but not employable. Two patients have been hospitalized, one for spread of tuberculosis as described above and one for other pulmonary difficulties. A total of thirty-two reports did not indicate the patient's activity.

Discussion

At Ancker Hospital considerable interest has been directed to the fate of the the patient with bilateral disease. Of the 238 patients in the series, 116 had bilateral disease, however, only twenty-six patients have undergone bilateral resections, three patients had multiple resections on the same side in order to close bronchopleural fistulas, and ninety had unilateral surgery.

Of the ninety patients with bilateral disease that had resectional surgery on only one side, fifteen died following their first surgery. Twelve refused a second operation, and twelve left the hospital against medical advice before the second operation could be performed. Nine patients had such poor physical condition and pulmonary reserve that a second operation was deemed contraindicated. One patient had the second operation at another hospital. There were eight patients with bilateral disease lost in the follow-up studies. The remaining thirty-three were treated successfully with continued bed rest and chemotherapy. At the present writing all of the patients with bilateral disease are considered to be arrested cases except those lost to follow-up and the one patient who is still hospitalized and whose case was discussed in the paragraph on postoperative spread.

Interest has also been directed to the use of chemotherapy for only short periods of time before resectional surgery is performed. In thirty-eight patients preoperative chemotherapy and bed rest was used for less than three months for

various reasons. These reasons included the possibility of the presence of a pulmonary malignancy, only minimal disease and the lack of preoperative positive bacteriology. The follow-up results in this select group of patients is comparable to the entire series, and furthermore there were fewer complications. Only one death is reported among this group. The total complication rate is 10.6 per cent for patients receiving less than three months preoperative chemotherapy compared with 21.4 per cent for similar complications in the entire series. It is admitted that short-term chemotherapy has been used only in select patients but the fact is emphasized that it is a successful procedure in cases where surgery performed early is indicated.

Summary

1. A total of 269 pulmonary resections have been performed upon 238 patients at Ancker Hospital between January of 1948 and July of 1955.

2. An immediate postoperative mortality of 7.14 per cent and a total over-all hospital mortality of 7.98 per cent was found.

3. Bronchopleural fistulas occurred in twelve patients, an operative incidence of 4.46 per cent. Bronchopleural fistulas were found to occur more often in patients with bilateral disease and far advanced disease. There was no correlation between the occurrence of the bronchopleural fistulas and the preoperative bacteriological studies, bacteriological examinations of the surgical specimen or the type of bronchial closures.

4. Postoperative spread of tuberculosis was found in thirty-five patients, an operative incidence of 13 per cent. Three cases had roentgenographic evidence only of spread, whereas thirty-two patients were found to have positive bacteriology without x-ray evidence of spread.

6. Miscellaneous complications were found in fifty-one patients (18.4 per cent incidence) in the hospital.

6. Follow-up studies reveal that only three patients have had positive bacteriologic findings since discharge. Full-time employment is engaged in 56.3 per cent of the patients.

7. The use of short term medical treatment preoperatively in select patients gives as good results as long-term therapy in the average patient.

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X-Ray Pelvimetry by the Colcher-Sussman Method

A Study Comparing It with Stereoscopic Parallax Pelvimetry

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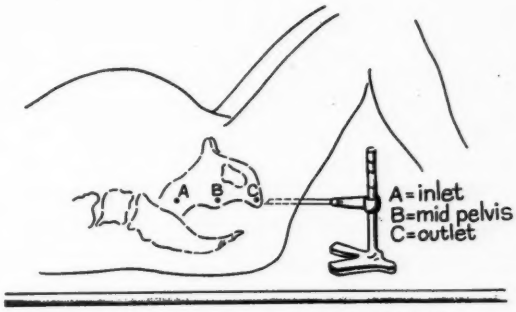
THERE is reason to believe that x-ray measurements of the pelvis are not being as widely applied in obstetric problems as they should be. One of the reasons for this may relate to confusion created by the bewildering array of methods available. Most of them involve the use of special equipment and complicated calculations and techniques which tend to discourage widespread usage. The purpose of this report is to encourage the use of a simple technique described by Colcher and Sussman[1] and to report the results of a study comparing this technique with another, the stereoscopic parallax method of Hodges.

The basic problem to be solved in x-ray pelvimetry is one of correcting for the divergent distortion produced when objects are x-rayed. The image produced is invariably larger than the object x-rayed. The distortion increases with increasing object-film distance, and is reduced by increasing tube-film distance. It is clear that objects in the same plane, equidistant from the film will show equivalent distortion when x-rayed. The x-ray pelvimetry techniques which are most readily understood and simplest to apply are the so-called "position" methods which utilize this principle.

To correct for distortion in the AP pelvic diameters of obstetric interest, all of which are in the mid-saggital plane, it is only necessary to insert a radio-opaque marker or ruler with markings of known length between the patient's buttocks. If a true, or nearly true lateral view is obtained, it follows that the diameters in which we are interested and the marker are similarly distorted and that corrected measurements can be obtained simply by using the image of the marker for their measurement on the film.

The problem involved in applying the position principle to the transverse diameters of the pelvis is greater, however, since these diameters are ordinarily not in the same plane and their position relative to the film is difficult to determine. The



COLCHER-SUSSMAN A-P POSITIONING

Fig. 1.

method of Colcher and Sussman is one of appealing simplicity designed to obviate the difficulties here. This method is based upon the thesis that if the patient is positioned completely flat on her back on the x-ray table with thighs and knees flexed, the position of the pelvis is such that the greatest transverse diameter of the inlet, the interspinous diameter and the intertuberous diameter are all in the same plane and parallel to the film (Fig. 1). Since the level of the intertuberous diameter can be readily determined by external palpation, this means, if the thesis be true, that a marker can be placed at the same level as the diameters in which we are interested and again the corrected measurements can be obtained simply by measuring with the marker image.

Colcher and Sussman did not report any check on the accuracy of their method beyond stating that no fetal death resulting from disproportion occurred in a series of 450 cases in which it was used. The technique does not lend itself to checking with a dried pelvis, since the whole prin-

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ciple involves proper positioning of the patient. It was, therefore, thought worthwhile to check the method by comparing it with one of recognized accuracy.

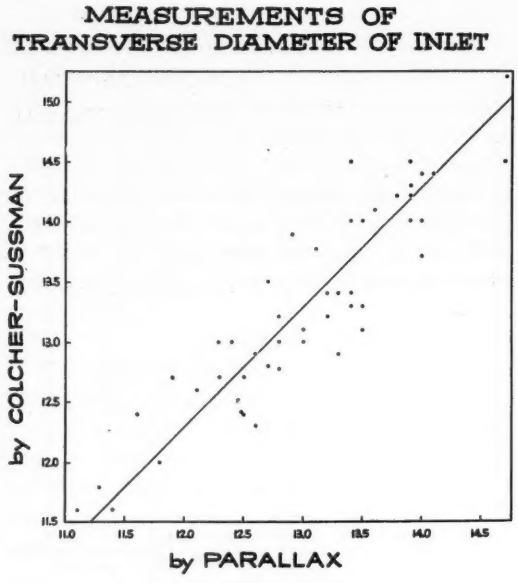

Fig. 2.

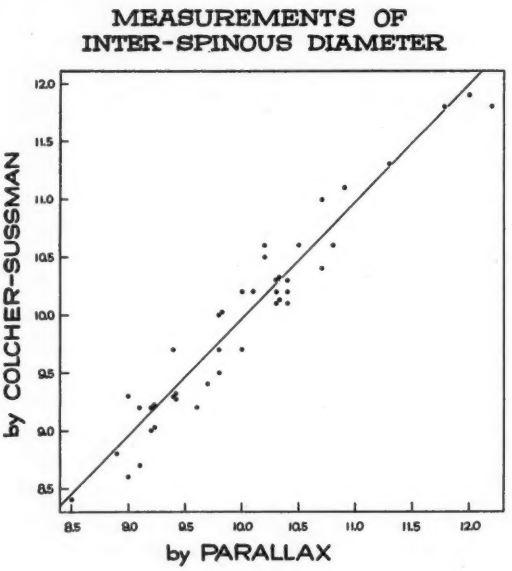

Fig. 4.

Method and Results

A check on the transverse diameters in a series of forty-nine pelvimetries was done by using simultaneously the Colcher-Sussman technique and the stereoscopic parallax method of Hodges. Patients were positioned as for the Colcher-Sussman method with the marker properly placed and two exposures were then made, the second after shifting the x-ray tube in accordance with the Hodges method.

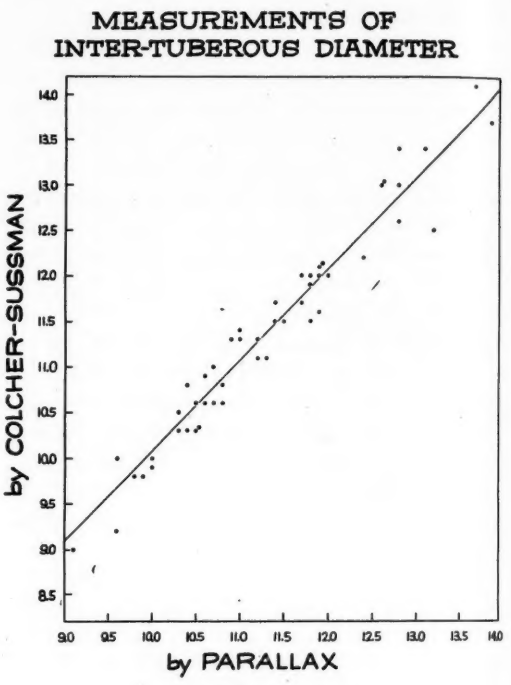

Fig. 3.

The amount of variation in results obtained by the two methods is shown in Table I and the scattergraphs (Figs. 2, 3, 4). The interspinous diameter could be determined by both methods in only forty-two cases because satisfactorily sharp end points could not be recognized in the remainder.

To clarify Table I somewhat by example, if one were to obtain an interspinous measurement by the Colcher-Sussman method of 10.0 cm., it could be said that the "best guess" as to what the corresponding measurement by parallax would be is 10.0 + 0.06 or 10.06, and one could be "95 per cent" confident that the parallax measurement would fall between 9.61 and 10.51 cm.

The data with respect to the transverse diameter of the inlet show that the measurement obtained by the Colcher-Sussman method is quite consistently larger than that obtained by paral-

TABLE I. ANALYSIS OF RESULTS OBTAINED BY COLCHER-SUSSMAN (C. S.) AND PARALLAX (PAR.) PELVIMETRY

Diameter	Transverse of Inlet	Inter-Spinous	Inter-Tuberous
Number of measurements	49	42	49
Mean difference C.S.—Par (Cm.)	+0.28	−0.06	+0.06
Standard deviation of differences	0.35	0.22	0.26
95% confidence interval	Par = C.S. -0.28 ± 0.71	Par = C.S. $+0.06 \pm 0.45$	Par = C.S. -0.06 ± 0.53

lax. Thirty-four were larger, nine smaller, and in six the results by the two methods were identical. With respect to the interspinous measurement, however, twenty-four readings by the Colcher-Sussman method were smaller than those obtained by parallax, twelve were larger, and again in six there was no difference. In the case of the intertuberous diameter, twenty-four measurements by the Colcher-Sussman method were larger, seventeen smaller, and eight no different than those obtained by parallax. This indicates that in this series, the bony pelvic anatomy seldom made possible positioning which put all three diameters in the same plane. It is also clear that the transverse diameter of the inlet is quite consistently farther from the film than the other two diameters.

Comment

The variability in results obtained with the two methods seems considerable. However, the precision of all pelvic measurements is subject to variations resulting from human error and inconsistency which may be of comparable magnitude. These result partly because an element of judgment enters into the selection of end points and partly because of other human inconsistency. The extent of this problem had been studied by Lilienfeld, Treptow and Dixon.[2] In this study, two individuals read a large series of pelvimetry films twice independently, and the consistency (or inconsistency) found in measuring the same film twice by one individual and the variations in results obtained by two individuals reading the same film was determined. The comparison between this variability and that shown between two methods as determined by this study, is shown in Table II. The data indicate that the differences shown by this study closely approximate the error inherent in all methods.

The isometric technique of Steele and Javert was used in the series reported on by Lilienfeld et al. These authors quoted Nicholson as reporting comparable errors associated with measurements obtained with his stereometric technique.

TABLE II. VARIABILITY BETWEEN METHODS COMPARED WITH ERRORS OF MEASUREMENT

	CS—Par (1)	A_1—A_2 (2)	A_1—B_1 (3)	*Standard Error of Measurement (4)
Transverse of inlet	0.35	0.24	0.40	0.28
Inter-spinous	0.22	0.30	0.38	0.27
Inter-tuberous	0.26	0.49	0.74	0.53

(1) Standard deviation of differences between Colcher-Sussman & Parallax method, present study.
(2) Standard deviation of the difference between A's first and second readings based on approximately 211 pelvimetry readings (from Lilienfeld et al.)
(3) Standard deviation of the difference between A's first and B's first readings based on approximately 104 readings (from Lilienfeld et al.)
(4) Standard error of measurement as calculated by Lilienfeld using formula: standard error equals $1/\sqrt{2}$ times corresponding figures in column 3.

*An estimate of the standard deviation of the error distribution o a series of readings by a single individual.

The measurements in this study for each method were taken from identical end points. Since this removed one variable in interpretation, it is probably not quite fair to conclude that the differences obtained by the two techniques could as logically be ascribed to human error as to any real difference in the two methods. It is also true that there is more consistent variation in the transverse diameter of the inlet than in the interspinous or intertuberous diameters, suggesting that there is a real difference between the methods with respect to this measurement. Nevertheless, it is clear that the variability in results obtained by the two methods under discussion is at least of the same order of magnitude as one would expect to occur with repeated measurement of the same set of films by one individual.

It seems fair to conclude then that, with the possible exception of the transverse diameter of the inlet, the differences in results in measuring transverse diameters of the pelvis by the two techniques described here can be as logically attributed to human error and inconsistency as to any real difference in the techniques. Since precision greater than that inherent in the interpretation of films regardless of technique is not real, it would seem logical to recommend the simpler technique.

Summary

A comparison between results in measuring transverse diameters of the obstetric pelvis by two x-ray techniques, that of Colcher and Sussman and

(Continued on Page 598)

Hennepin County Neonatal Mortality Study

1953 Report

THE Hennepin County Neonatal Mortality study is an analysis of all deaths occurring in Hennepin County in infants under twenty-eight days of age. The study, begun January 1, 1952, is a co-operative undertaking sponsored by the Hennepin County Medical Society, Minneapolis Pediatric Society, Minneapolis Health Department, Minneapolis Hospital Council, Departments of Pediatrics and Pathology of the Medical School of the University of Minnesota, and the Minnesota Department of Health. The committee working on the study is drawn from all these groups. The 1953 study is the second annual report.

The collaboration of all groups and specialties previously mentioned in the first report was continued. General practice, obstetrics, pediatrics, pathology, anesthesiology, roentgenology, and hospital administration have been represented on the committee. Physicians in private practice, teaching, and public health have added their knowledge to the analysis of the data. The study form has been carefully reviewed by the committee in order to make the records more accurate. The objective is to impress upon all the importance of obtaining and recording the pertinent data of the mother in pregnancy and labor and of the resulting offspring. It is hoped, too, that the completion of the forms will in itself be instructive.

Since our previous publication in July, 1954,[1] many reports have appeared in the literature. The American Medical Association has also established a clearing house for information for various states with Neonatal Mortality Committees. The problem of stillbirths was added to the scope of the Hennepin County Neonatal Mortality Committee in 1955, so that the designation of Hennepin County Perinatal Mortality Committee is now more appropriate. Analysis of stillbirths and neonatal deaths is very necessary in order to have a complete prenatal and postnatal picture.

The Committee in making the 1953 report will make comparisons with the 1952 report. Tables will be similar except for amplification to show neonatal deaths at various weights—below 1000 grams, 1000 grams—1499 grams, 1500 grams—1999 grams, 2000-2499 grams; 2500 grams and above will be considered full term. It should be noted that tables on congenital anomalies and parity have been omitted and will be considered in separate papers. It is hoped that those interested in the study will review the previous report. This background will enable the reader to compare the years 1952 and 1953. As was mentioned in 1952, the continuing decrease in infant mortality is encouraging, but the good example of other communities demonstrates that improvements can still be made.

In this analysis of neonatal deaths, it should be kept in mind that mortality and morbidity are different problems and that this is a study of mortality. Percentages in our tables concern the only data we have, namely, those on deaths. We have no statistics on live infants. It is therefore impossible to give the relationship of deaths to live births of the various causes or associated conditions in neonatal deaths.

The 1953 study includes 379 neonatal deaths (365 single births and seven pairs of twins) born of 372 mothers. Of the seven pairs of twins, five pairs were below 1000 grams and two pairs between 1000 and 1500 grams. The sex was 215 males (56.7 per cent) and 164 females (43.3 per cent). There were 379 neonatal deaths in 20,261 live births in Hennepin County in 1953, a rate of 18.7 neonatal deaths per 1000 live births.

Neonatal Deaths by Birth Weights

It is of interest that the figures for the percentage of deaths in the premature and full term infants are similar for both years; in 1952, 70.8 per cent premature and 28.5 per cent full term; in 1953, 71.2 per cent premature and 28.8 per cent full term. (Table I.)

In 1952 there were two cases (0.7 per cent) with no birth weight. Perhaps of note is a greater occurrence of deaths below 1000 grams in 1953,

Prepared by the Hennepin County Neonatal Mortality Study Committee, Minneapolis, Minnesota.

TABLE I. BIRTH WEIGHTS IN 1953 AND 1952

Weight	1953			1952	
	No.	Per Cent		No.	Per Cent
Less than 1000 Gm. (2 lb. 3 oz. or less)	119	31.3			
1000-1499 Gm. (2 lb. 4 oz.—3 lb. 4 oz.)	60	15.8	71.2	236	70.8
1500-1999 Gm. (3 lb. 5 oz.—4 lb. 6 oz.)	37	9.8			
2000-2499 Gm. (4 lb. 7 oz.—5 lb. 7 oz.)	54	14.3			
2500 Gm. and over (5 lb. 8 oz. and over)	109	28.8	28.8	95	28.5
Unknown				2	0.7
Total	379	100.0		333	100.0

TABLE II. AUTOPSIES BY INFANTS' BIRTH WEIGHT IN 1953 AND 1952

Weight in Grams	1953			1952	
	Autopsies No./No. Infants	Autopsies Per Cent		Autopsies No./No. Infants	Autopsies Per Cent
Under 1000	40/119	33.6			
1000-1499	31/60	51.7	51.9	122/238	51.3
1500-1999	30/37	81.1			
2000-2499	39/54	72.2			
2500 and over	95/109	87.2	87.2	74/95	77.9
Total	235/379	62.0		196/333	58.9

119 cases (31.3 per cent) and in 1952, 91 cases (27.3 per cent). The neonatal death rate rose from 17.8 in 1952 to 18.7 in 1953. Prematurity is the major problem in neonatal deaths. Of particular concern is the problem of infants weighing below 1000 grams. This is the responsibility of those physicians providing obstetric care.

in 1953, compared to about eight out of ten in 1952.

The recognition of the necessity for autopsies is essential. The average doctor is impressed with the need of getting autopsies on larger infants, but, unfortunately, this will not give the complete picture. The doctor must revise his attitude and include the very small infants as well as the stillbirths in requesting autopsies. Even in babies weighing under 1000 grams (the so-called previable group) significant anatomic abnormalities may be found.

Much might be said about adequate autopsies —complete—inclusive of the head, with bacteriologic study when autopsies are done soon after death, and microscopic study of all organs. Perhaps more pathologists interested in the neonatal period would be the answer.

TABLE III(a) AGE OF MOTHERS BY INFANTS' BIRTH WEIGHT, 1953

Age of Mothers	Weight of Infant in Grams						
	Under 1000	1000-1499	1500-1999	2000-2499	2500 and Over	Total	Per Cent
19 and under	8	6	2	1	6	23	6.2
20-24	34	19	7	15	32	107	28.8
25-29	31	18	13	17	24	103	27.7
30-34	24	9	14	8	22	77	20.6
35-39	11	4	1	9	14	39	10.5
40 and over	3	2		4	3	12	3.2
Not recorded	3				8	11	3.0
Total	114	58	37	54	109	372	100.0

TABLE III(b) AGE OF MOTHERS BY INFANTS' BIRTH WEIGHT, 1952

Age of Mothers	Weight of Infant in Grams		Total	
	Under 2500 Gm.	2500 Gm. and Over	No.	Per Cent
19 and under	13	3	16	5.0
20-24	77	25	102	31.9
25-29	59	26	85	26.6
30-34	43	17	60	18.8
35-39	27	4	41	12.8
40 and over	2	1	3	0.8
Not recorded	4	9	13	4.1
Total	225	95	320	100.0

Autopsies

The higher number of deaths in prematures in 1953 was not matched by an increased percentage of autopsies (Table II). Whereas, in 1952, of prematures below 1000 grams 47.3 per cent had autopsies, in 1953, 33.6 per cent had autopsies. However, in 1953 the percentage of autopsies in full term infants was increased. Necropsies were obtained in about nine out of ten neonatal deaths

Ages of Mothers—Neonatal Deaths

The tables of distribution of deaths per age of mothers again appear to represent the distribution of total births (Tables IIIa and IIIb). This should not be misconstrued to mean that proportionally there are more deaths in infants of mothers of a certain age. There are more births at these ages. The 1953 tables show a more complete breakdown of deaths per weight of infant than the 1952 tables.

TABLE IV. MOTHERS' SEROLOGIC TEST FOR SYPHILIS BY INFANTS' BIRTH WEIGHT, 1953

Serologic Test Result	Infant Weight in Grams				
	Under 1000	1000-1499	1500-1999	2000-2499	2500 and Over
Positive		1*			1**
Negative	86	35	28	38	75
Not recorded	31	23	9	16	33
Per cent obtained	73.5	61.0	75.7	70.4	69.7

*Serologic test for syphilis positive 1942, penicillin given in this and previous pregnancy.
**Congenital lues, treated before pregnancy with 4,800,000 units penicillin over 10 days.

cent, as compared with 34 per cent in 1952 (Table V). Again, in almost two-thirds of the pregnancies there were no known obstetric abnormalities. As in the previous reports, obstetric complications, mostly abruptio placentae, placenta previa, undiagnosed types of antenatal bleeding and toxemia, were considerably more common in the premature deliveries.

In thirty-five cases of antenatal bleeding the causes were listed as unknown. It is felt that a definite diagnosis should have been made in most

TABLE V. OBSTETRIC COMPLICATIONS BY INFANTS' BIRTH WEIGHT IN 1953 AND 1952

Complication	Weight of Infant in Grams, 1953						1952		
	Under 1000	1000-1499	1500-1999	2000-2499	2500 and Over	Total	Under 2500	2500 and Over	Total
Abruptio placentae	3	5	5	1	1	15	23	4	27
Antenatal bleeding	18	7	5	2	3	35	14	3	17
Cause unknown									
Placenta previa	2	5	3	3	1	14	12		12
Toxemia of pregnancy	8	2	2	2	5	19	13	5	18
Hypertension	(3)		(1)	(1)	(4)	(9)			
Polyhydramnios	2		1	2	3	8	6	4	10
Infection	8	2	2	1	3	16	10	3	13
Influenza	(4)	(1)			(3)	(8)	(8)	(3)	(11)
Appendicitis	(1)					(1)	(2)		(2)
Endocervicitis	(1)		(1)			(2)			
Polio during pregnancy	(1)		(1)			(2)			
Varicella at delivery		(1)				(1)			
Infectious hepatitis at delivery				(1)		(1)			
Gonorrhea at delivery	(1)					(1)			
Pelvic inadequacy		1		5	1	7			
Anemia	1				1	2	5		5
Diabetes					4	4	1	2	3
Prolapsed cord	1		3	2	3	9	1	2	3
Rheumatic heart disease	1			1		2	1		1
Infarction placenta	2	1	1			4			
Pleural effusion		1				1			
Fall on ice, week before delivery		1				1			
Bicornate uterus		1				1			
Total	46	26	22	19	25	138	86	23	109

In the group of infants weighing less than 1000 grams the lack of development of the lungs may be the deciding factor in the baby's death, according to Potter;[2] in the full term group of infants, congenital abnormalities account for most deaths. The cause of death among stillbirths is still undetermined and awaits further reports.

Syphilis

Serologic tests for syphilis were done in 264 of the 372 mothers in this study (72.5 per cent) (Table IV). Two of these mothers had positive serology and received adequate antiluetic therapy during their pregnancies. Neither of the infants of these mothers had evidence of syphilis at autopsy.

Obstetric Complications

In the 1953 Hennepin County report of 372 mothers and 379 offspring, obstetric complications were encountered in 138 pregnancies, or 37 per

of these cases. The main causes of antepartum bleeding are abruptio placentae and placenta previa. In 1952 only seventeen cases of antenatal bleeding were considered as cause unknown. Polyps, bleeding erosion, and carcinoma can be ruled out by speculum examination. It is remarkable that only one full term infant was lost from placenta previa in 1953. The chief causes of intrauterine anoxia (the main cause of fetal loss) are placenta previa and abruptio placentae. Where there is bleeding late in pregnancy, especially placenta previa, an expectant type of management with sensible precautions does not compromise the mother's safety. In the interest of the fetus and the avoidance of fetal wastage, the best possible procedure is prolonged gestation to the relatively safe period of thirty-six weeks and beyond. All placentas should be carefully examined after delivery for evidence of pathology.

(Turn to Page 589)

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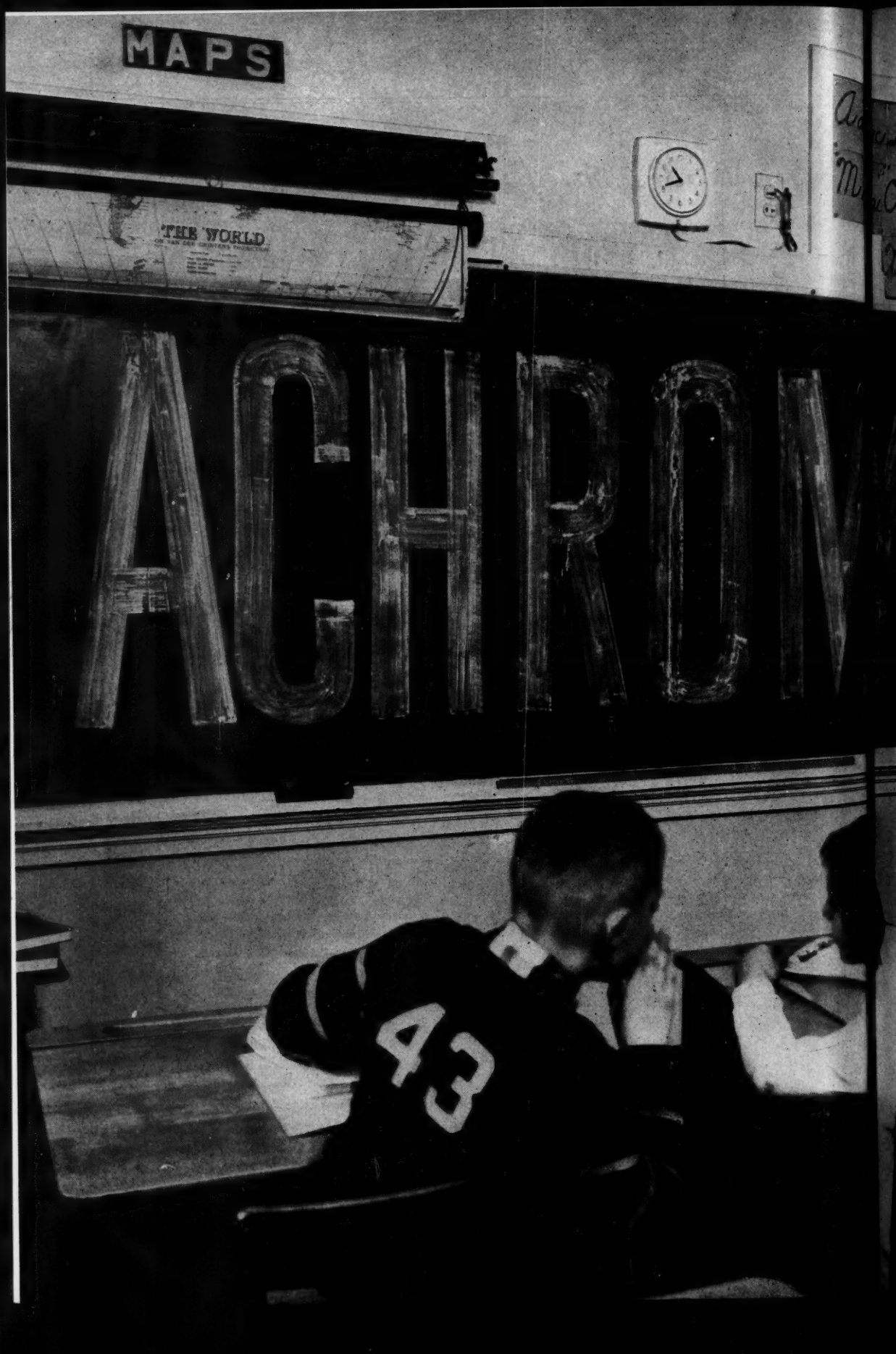
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[1]January, H. L. et al: Clinical experience with tetracycline. *Antibiotics Annual* 1954-55, p. 625.

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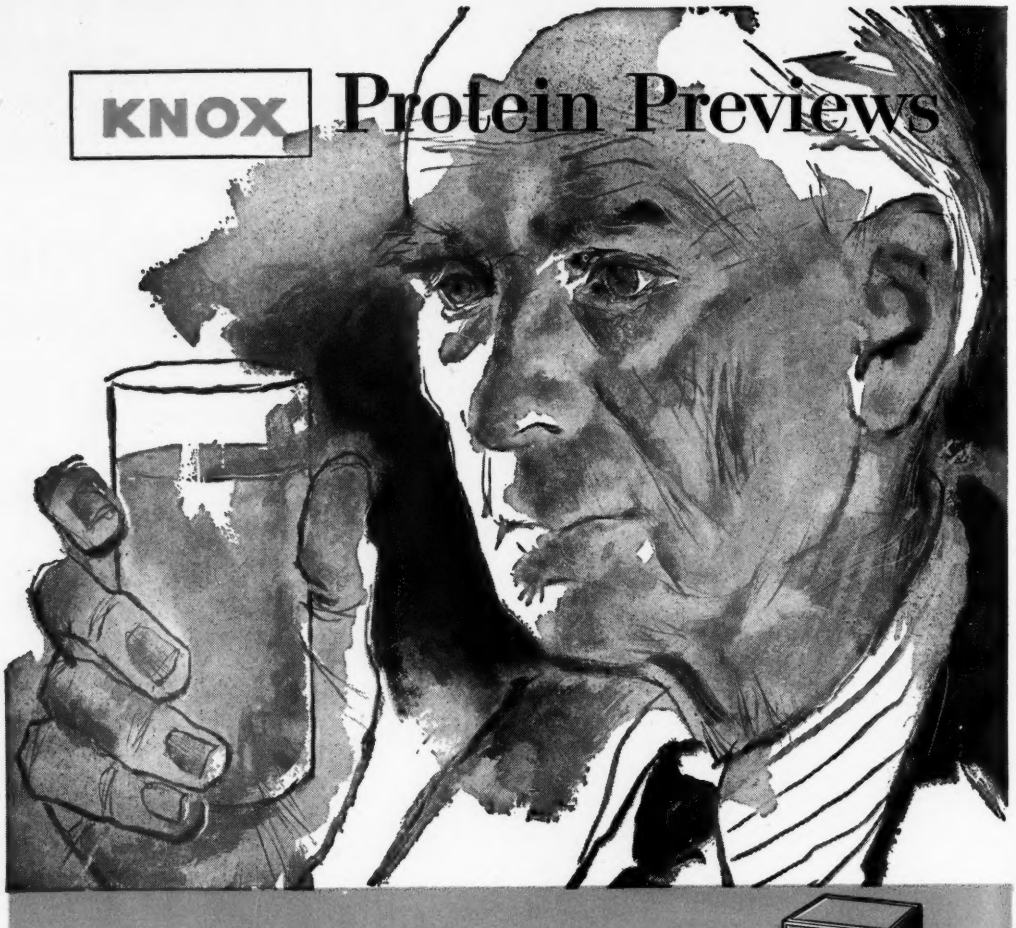

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Type of Delivery

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TABLE VI. TYPES OF DELIVERY BY INFANTS' BIRTH WEIGHT IN 1953 AND 1952

Type of Delivery	Weight of Infant in Grams, 1953							1952			
	Under 1000	1000-1499	1500-1999	2000-2499	2500 and Over	Total No.	Total Per Cent	Under 2500	2500 and Over	Total No.	Total Per Cent
Cephalic	74	29	24	32	88	247	65.2	131	69	200	60.1
Breech	39	24	7	8	12	90	23.7	69	8	77	23.1
Version and extraction		2		3	5	10	2.7	1	2	3	0.9
Cesarean section	6	5	6	11	4	32	8.4	23	9	32	9.6
Unknown								14	7	21	6.3
Total	119	60	37	54	109	379	100.0	238	95	333	100.0

TABLE VII(a) MOTHERS' RH DETERMINATIONS BY INFANTS' SPECIFIC BIRTH WEIGHT, 1953

Rh Determination	Weight of Infant in Grams					
	Under 1000	1000-1499	1500-1999	2000-2499	2500 and Over	Total
Rh positive	62	32	25	35	54	208
Rh negative	13	1	4	5	23	46
Rh not recorded	39	25	8	14	32	118
Total	114	58	37	54	109	372
Per cent Rh Determinations obtained	65.8	56.9	78.4	74.1	70.6	68.3

TABLE VII(b) MOTHERS' RH DETERMINATIONS IN 1953 AND 1952

Rh Determination	1953		1952	
	No.	Per Cent	No.	Per Cent
Rh positive	208	55.9	171	53.4
Rh negative	46	12.4	52	16.3
Rh not recorded	118	31.7	97	30.3
Total	372	100.0	320	100.0
Per cent obtained	68.3		69.7	

In the whole group of deliveries, about 65 per cent were cephalic and 24 per cent were breech, closely approximating the 1952 report (Table VI). Immature births are frequently associated with breech deliveries which decrease in frequency with increase in birth weight. Cesarean sections contributed 8.4 per cent of neonatal deaths. The avoidance of podalic version and difficult midforceps deliveries with studied management of mid-pelvic contractions is advised. Particular care must be exercised in delivery of the premature breech. Great discretion is necessary in the choice of minimal obstetric analgesia and anesthesia. Saddle block anesthesia is often of value. Early diagnosis of multiple gestation with restriction of activities in such cases from the seventh month is recommended.

Erythroblastosis Fetalis

The Rh factor was determined in only 70 per cent of mothers whose babies died, but it should be determined in all pregnancies. There were no ABO incompatibilities reported in this study. The breakdown by weight shows a somewhat larger proportion of the Rh determinations not done in mothers of infants below 1500 grams (Table VIIa). This might be due to the mothers not seeing the physician before onset of labor. Of the total Rh determinations in the 1953 study 81.9 per cent of the mothers were Rh positive and 18.1 per cent were Rh negative. In the 1952 study, 23.4 per cent of mothers were Rh negative. There is insufficient Rh data on the husbands of Rh negative mothers, and necessary Rh data in children and fathers has not been receiving sufficient attention. It is felt that the Rh test should be repeated during subsequent pregnancies because of occasional laboratory errors, especially when done prior to 1952. The value of antibody titre determinations in predicting the status of the fetus *in utero* is now being questioned by some authorities. Because of the reasoning that the major damage to fetal erythrocytes by maternal antibodies occurs in the last month of pregnancy, it formerly was advocated that pregnancy should be terminated about the eighth month. This procedure is no longer favored, as it is thought that the hazards of prematurity and the chances of getting a defective child outweigh the possibility of additional damage occasioned by longer exposure to maternal antibodies. Babies sensitized to the Rh factor do not tolerate prematurity well.

To promote fetal salvage, preparations should be made for immediate blood typing and Coomb's test on the cord blood, with exchange transfusions when indicated. The hemoglobin level (in grams) and the red blood count should be closely observed. Bilirubin levels should be done on the cord and repeated later on the infant.

TABLE VIII. INDICATIONS FOR CESAREAN SECTION BY INFANTS' BIRTH WEIGHT IN 1953 AND 1952

Indication for Cesarean Section	Weight of Infant in Grams, 1953						1952		
	Under 1000	1000-1499	1500-1999	2000-2499	2500 and Over	Total	Under 2500	2500 and Over	Total
Toxemia	6	1	2		1	10	8	1	9
Placenta previa		2	2	2	1	7	5		5
Abruptio placentae		1	1	1		3	2		2
Contracted pelvis		1*		4*		5	3	3	6
Post-mortem			1			1			
Rh incompatibility				1	2	3		1	1
Prolapsed cord				2		2			
Previous Cesarean section				1*		1	3	1	4
Diabetes								2	2
Breech							1	1	2
Osteomyelitis hips							1		1

*elective.

TABLE IX(a) DURATION OF LIFE BY INFANTS' BIRTH WEIGHT, 1953

Duration of Life	Weight of Infant in Grams								Total	
	Premature				Under 2500		Full Term 2500 and Over			
	Under 1000	1000-1499	1500-1999	2000-2499	No.	Per Cent	No.	Per Cent	No.	Per Cent
Under 1 hour	17	5	5	7	34	12.6	11	10.1	45	11.9
1-24 hours	71	35	16	19	141	52.2	36	33.0	177	46.7
25-48 hours	16	16	8	14	54	20.0	24	22.0	78	20.6
2-7 days	14	2	6	10	32	11.9	26	23.9	58	15.3
8-28 days	1	2	2	4	9	3.3	12	11.0	21	5.5
Total					270	100.0	109	100.0	379	100.0

TABLE IX(b) DURATION OF LIFE BY INFANTS' BIRTH WEIGHT, 1952

Duration of Life	Weight of Infant in Grams				Total	
	Under 2500 Gm.		2500 and Over			
	No.	Per Cent	No.	Per Cent	No.	Per Cent
Under 1 hour	34	14.3	6	6.3	40	12.0
1-24 hours	126	52.9	29	30.5	155	46.5
25-48 hours	32	13.4	15	15.8	47	14.2
2-28 days	46	19.4	45	47.4	91	27.3
Total	238	100.0	95	100.0	333	100.0

Cesarean Section

Again the relatively high incidence of cesarean sections in neonatal deaths was due to obstetric complications (Table VIII). There were thirty-two sections, or 8.4 per cent. Most of these were done to deliver an immature infant of 1000-2500 grams (twenty-two cases), especially for emergency section in placenta previa or abruptio placentae. In six instances a section was done for toxemia of pregnancy with the fetus weighing 1000 grams or under. The four full term neonatal section deaths were due in two instances to Rh incompatibility, plus one instance each from toxemia and placenta previa.

There were six neonatal deaths associated with elective section, all of which were immature. It was felt that in several cases there was a definite error of judgment in the timing of the repeat elective section. When they are premature, many elective section babies do not do well. The physician should use all available methods at his command to evaluate fetal age preoperatively. The frequency of miscalculation on the basis of the last menstrual period is well known. Elective section must be avoided unless the child is sufficiently large. Prevention of premature delivery would be possible by doing the section at or only a few days prior to term.

Early detection or treatment of toxemia factors should be emphasized. Near term there is no problem other than the method of delivery. One should attempt to carry the pregnancy through the thirty-third or thirty-fourth week to increase,

if possible, the premature survival rate. Prior to this time a true toxemia patient poses a serious problem. Many fetuses die *in utero* after two or three weeks of persistent toxemia. Prolongation of pregnancy may cause serious fetal and maternal damage.

TABLE X(a) CAUSES OF DEATH BY INFANTS' BIRTH WEIGHT, 1953

Cause of Death	Weight of Infant in Grams					Total	
	Under 1000	1000-1499	1500-1999	2000-2499	2500 and Over	No.	Per Cent
Abnormal pulmonary ventilation	109	51	26	21	22	229	60.5
Immaturity unqualified	(80)	(20)	(8)	(4)	(0)	(112)	(29.6)
Atelectasis	(27)	(17)	(11)	(8)	(15)	(78)	(20.6)
Hyaline membrane disease	(2)	(14)	(7)	(9)	(7)	(39)	(10.3)
Congenital anomalies	3	5		14	40	62	16.4
Anoxia				5	2	7	1.8
Infection	0	3	5	4	14	26	6.9
Pneumonia		(3)	(3)	(3)	(11)	(20)	(5.3)
Septicemia			(2)	(1)	(3)	(6)	(1.6)
Blood dyscrasias							
Erythroblastosis fetalis			1	5	14	20	5.3
Birth trauma							
Intracranial hemorrhage	7		3	3	11	24	6.3
Other		1	2	2	6	11	2.8
Total	119	60	37	54	109	379	100.0

TABLE X(b) ANALYSIS OF CAUSES OF DEATH BY INFANTS' BIRTH WEIGHT, 1952

Cause of Death	Premature		Full Term		Total	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Abnormal pulmonary ventilation	165	69.3	14	15.0	179	53.7
Immaturity unqualified	(50)	(21.0)			(50)	(15.0)
Congenital anomalies	27	11.4	40	42.1	67	20.1
Anoxia (fetal and unspecified)	15	6.3	9	9.4	24	7.2
Infection	12	5.0	10	10.5	22	6.6
Birth trauma	7	2.9	6	6.2	13	3.9
Blood dyscrasias	5	2.1	13	13.7	18	5.4
Other	7	2.9	3	3.1	10	3.0
Total	238	99.9	95	100.0	333	99.9

The type of analgesia, preoperative medication and anesthesia employed in a section greatly influence the condition of the fetus. Asphyxiating anesthesia should be avoided. Conduction anesthesia is being used more frequently by physicians because of the possible deleterious effect of general anesthesia on the infant. Many prefer local or spinal anesthesia with oxygen inhalation until the infant is delivered when some administer intravenous penthothal during closure. Local anesthesia is generally considered the safest for the infant. Inhalation is still preferred by some when administered safely by a well controlled team in competent hands.

Duration of Life

The duration of life in premature infants was under one hour in 12.6 per cent; one to twenty-four hours, 52.2 per cent; twenty-five to forty-eight hours, 20.0 per cent; two to seven days, 11.9 per cent; eight to twenty-eight days, 3.3 per cent (Table IXa). In full term infants the respective percentages were 10.1, 33.0, 22.0, 23.9 and 11.0. Of all neonatal deaths in 1953, 11.9 per cent died within the first hour, 58.6 per cent died during the first twenty-four hours, almost 80 per cent within the first forty-eight hours and 95 per cent within the first seven days. These percentages are similar to the 1952 study (Table IXb).

Causes of Death

It is of note how similar the percentages are for causes of death in 1952 and 1953 (Tables Xa and Xb). In 1952, abnormal pulmonary ventilation accounted for 53.7 per cent of the deaths; in 1953, 60.5 per cent of deaths. In 1952, only 15.0 per cent of cases were classified as immaturity unqualified compared to 29.6 per cent in 1953. This may be accounted for by the larger proportion of deaths under 1000 grams (in 1953, 31.3 per cent of deaths below 1000 grams; in 1952, only 27.3 per cent). Congenital anomalies caused 20.1 per cent of deaths in 1952 and 16.4 per cent in 1953. It is interesting to compare the deaths due to anoxia, 7.2 per cent in 1952 and only 1.8 per cent in 1953. The percentage of

deaths due to infection is almost identical in both years, 6.6 per cent in 1952, and 6.9 per cent in 1953. Birth injury is more frequent in the 1953 series, 6.3 per cent as against 3.9 per cent in 1952. This may be accounted for by the number of deaths in infants below 1000 grams. Blood dyscrasias accounted for 5.4 per cent of deaths in 1952 and 5.3 per cent of deaths in 1953. "Other causes" were 3.0 per cent in 1952 and 2.8 per cent in 1953. In 1953 the eleven cases listed under "other causes" included bilateral pneumothorax, tetany of the newborn and undetermined causes of death in full term infants.

Preventable Deaths

There were seventeen obstetric, two obstetric-pediatric, and nine pediatric preventable deaths in 1953, which are broken down by infant weight groups below. Thus 7.4 per cent were rated as preventable deaths.

Below 1000 Grams

No obstetric or pediatric preventable deaths.

1000-1499 Grams

1. One Obstetric Preventable Death.

A twenty-three-year-old mother had three previous pregnancies, two full term and one premature infant. She had previously had a cesarean section for a generally contracted pelvis and was electively sectioned at thirty-one weeks of gestation. Anesthesia included nitrous oxide, ethylene, cyclopropane for five minutes before delivery. The infant weighed 3 pounds ¼ ounce, had poor color and grunting respirations, and lived for twenty-four hours. Autopsy of the infant disclosed bilateral atelectasis and hyaline membrane disease of the lungs.

2. No Pediatric Preventable Deaths.

1500-1999 Grams

1. Three Obstetric Preventable Deaths.

A twenty-four-year-old mother, who had previously had one full term infant and two miscarriages, had vaginal bleeding for one and one-half days in the second month of pregnancy. At thirty-six weeks of gestation she was electively induced with intravenous pitocin and rupture of the membranes. The infant weighed 4 pounds, ½ ounce, had dusky color and rapid shallow respirations, and lived for ten hours, eighteen minutes. Autopsy of the infant disclosed bilateral atelectasis and hyaline membrane disease of the lungs.

A thirty-three-year-old mother, who had previously had three full term infants, had several episodes of spotting during the second half of the pregnancy. After two hours and thirty-five minutes of labor, during which she received nitrous oxide, ethylene, and cyclopropane anesthesia for one hour, she delivered a 4 pound, 4 ounce infant that did not breathe for the first ten minutes and then only gasped about once per minute for thirty-five minutes. Autopsy of the infant disclosed bilateral atelectasis of the lungs.

A thirty-year-old Rh positive mother had previously had two full term infants, one premature, and one miscarriage. The first stage of labor lasted five hours and the presentation was vertex with the infant's hand in front of the head. The cord was prolapsed. No consultation was sought. Anesthesia was nitrous oxide for five minutes. The infant, weighing 4 pounds 3½ ounces, was cyanotic and its respirations were shallow and poor. The infant was placed in an Air-lock and expired after five and one-half hours. Autopsy disclosed prolonged anoxia manifested by petechial hemorrhage in the viscera and serous surfaces, moderately severe fetal atelectasis, and increased hematopoiesis in the liver, cause unknown.

2. Two Pediatric Preventable Deaths.

A thirty-three-year-old mother (three previous full term infants, two previous prematures) had four weekly prenatal visits starting at the seventh month. Following three hours and twenty minutes of labor (no anesthesia mentioned), she gave birth to twins. The first twin lived and is not further mentioned. The second twin was a breech presentation and the color was cyanotic. At birth it was noted that the infant had a right harelip, cleft palate and a right club foot. Sternal retraction was present and the lungs were clear to percussion and auscultation. After twenty-nine hours the infant was offered 5 per cent solution of glucose in water by a medicine dropper. The sternal retraction persisted although at three days of age lungs were clear to percussion and auscultation. The infant then began having intermittent bouts of apnea, which were treated with suctioning and caffeine sodium benzoate with some improvement. The infant expired at three days of age. Antibiotics were not given. Autopsy disclosed bronchopneumonia (no cultures obtained at autopsy).

A thirty-three-year-old mother (three full term infants, two prematures) had toxemia on her first and fourth pregnancy, but not during the present pregnancy. Vaginal bleeding and rupture of the membranes occurred three days before delivery, at which time the blood pressure and urine were normal. The mother was admitted to the hospital, given bed rest and penicillin, and after two hours of labor delivered a 3 pound, 5½ ounce infant under interval nitrous oxide and oxygen anesthesia for eight minutes. The placenta showed signs of premature separation along one edge. The infant's color was fairly good, respirations labored with deep substernal retraction. The infant had four bloody stools during the first two days of age, no bloody stools subsequently. At four days of age the respirations continued to be labored and color became gray. Nine hours before death (the fourth day) the infant received 300,000 units of S.R. penicillin. A portable x-ray showed incomplete expansion of the right lung base. The respirations became more shallow and finally ceased. Autopsy disclosed aspiration of infected amniotic fluid, pneumonitis, and a terminal massive suppurative meningitis, nonspecific. No cultures were done.

2000-2499 Grams

1. Five Obstetric Preventable Deaths.

A thirty-two-year-old mother (two previous full term infants) with a platypelloid pelvis (true conjugate 10 cm.) and previous cesarean section had an elective section under local anesthesia at forty-one weeks of gestation. The infant weighed 4 pounds, 12 ounces, the color was initially good but became cyanotic, and chest x-ray showed ground glass density of both lungs. Respirations continued to be poor and the infant expired at thirty-nine hours. No autopsy was done. The cause of death was listed as congenital atelectasis.

A twenty-six-year-old primigravida had a normal pregnancy with the first stage of labor lasting six hours. Presentation was transverse. No consultation was sought. Version and extraction was done with five minutes of cyclopropane anesthesia before delivery. The second stage of labor lasted twenty-five minutes. The infant, the second of twins, weighed 5 pounds, 7½ ounces, and a cleft palate was present. It had no difficulty until the second day when cyanosis occurred which progressed until death at three days of age. An x-ray of the chest ruled out diaphragmatic hernia. Autopsy disclosed bilateral tearing of the tentorium with subtentorial hemorrhage and hemorrhage into the region of the third ventricle.

A twenty-eight-year-old mother (one previous full term infant born by cesarean section because of a previous history of fractured pelvis with a suspected disproportion) had an elective section under cyclopropane and ethylene anesthesia at thirty-seven weeks of gestation The infant weighed 5 pounds, 7½ ounces and received penicillin, humidity and oxygen in the incubator. The skin became cold, clammy and the respirations gradually became more shallow. A chest x-ray showed bilateral patchy areas of atelectasis. The infant expired at twenty-four hours of age. Autopsy disclosed bilateral hyaline membrane disease of the lungs.

A twenty-five-year-old mother (one previous full term infant) had elective forceps delivery OP to OA because of a face presentation and failure of rotation. No consultation was sought. The first stage of labor lasted four and one-fourth hours and the second stage twelve minutes. Delivery was under cyclopropane anesthesia (duration not stated). The infant weighed 5 pounds, 6 ounces, was waxy and pale (asphyxia pallida), had a painful high pitched cry with each breath, and ecchymotic areas were present over the head. Respirations continued to be poor with retraction noted. The infant died at twenty-five hours of age and autopsy disclosed birth trauma (marked hemorrhage and minimal tearing of the falx cerebri and tentorium cerebelli with mild subarachnoid hemorrhage in the occipital area). Bilateral atelectasis of the lungs was also present.

A thirty-year-old mother (one previous full term infant, one premature) had no prenatal care during the present pregnancy. She was admitted to the hospital in active labor with unruptured membranes. She was taken to the delivery room where it was found that the cervix was not dilated and only 50 per cent effaced. X-ray showed a shoulder presentation. Two hours following admission the membranes ruptured spontaneously, the cord prolapsed, and the fetal heart tones became faint. Instead of immediate cesarean section, there was a delay of one hour and thirty minutes during which the cord was replaced into the uterus by sterile vaginal manipulation. Cyclopropane anesthesia was given for fifteen minutes before delivery. There were no efforts at respiration by the infant who lived thirty seconds (heart beat only sign of life). The infant weighed 5 pounds, 6 ounces, and the cause of death was listed as immaturity.

2. Three Pediatric Preventable Deaths.

A forty-year-old mother (one previous full term infant by cesarean section for contracted pelvis) had an elective section at forty weeks under local anesthesia. The infant weighed 5 pounds, 3 ounces, and was pink at birth but became cyanotic on the way to the nursery. It had a good color in the Air-lock but became unusually cyanotic on removal from it. The physician decided that the condition of the infant was too critical to permit x-ray study. The child became more exhausted due to labored respirations and expired at twenty-eight hours. An autopsy disclosed a congenital cyst (12x12x18 mm.) of left lung with rupture, emphysema of lung and posterior mediastinum, pneumothorax, and hemorrhage due to anoxia. The right lung was extensively atelectatic.

A thirty-year-old mother (two previous full term infants) was Rh negative with an Rh positive husband. No Rh antibodies were present until five days before delivery when the albumin test was 1:4. Following a labor of six hours the infant was delivered by low forceps and weighed 4 pounds, 14 ounces. The infant appeared normal at birth and had a normal hemoglobin. During the next three days, however, it developed rapidly increasing icterus and appeared weaker and showed evidence of spasticity in the extremities. An exchange transfusion was not done until the third day of life when 250 cc. of blood was administered and 220 cc. removed. No laboratory work was recorded except the initial normal hemoglobin, and the infant expired at four days of age. Autopsy disclosed erythroblastosis fetalis and kernicterus.

A forty-three-year-old mother (four previous full term infants) had a severe fall on the ice at the third lunar month. The first stage of labor was approximately one and one-half hours and the presentation was footling breech. The second stage of labor was thirty minutes and there was no cord pulsation present. Manual dilitation of the cervix was done after the breech and the body was born. No consultation was sought. The infant weighed 5 pounds, 6 ounces, and had no heart action until intracardiac adrenalin was given along with tracheal intubation and suction. The baby remained in coma with irregular gasping respirations. Feedings were started at two days of age and taken fairly well until death at seven days of age. Penicillin was given, amount not stated. Autopsy disclosed aspiration pneumonia, multiple pulmonary abcesses and necrotic nodule in the left adrenal gland. No blood cultures were done.

2500 Grams and Over

1. Eight Obstetric Preventable Deaths.

A thirty-year-old primigravida had mild toxemia (blood pressure 140/90). Measurements were inter-

spinous 27 cm., intercrestal 29 cm., intertuberous 32 cm., external conjugate 20½ cm., diagonal conjugate 12 + cm, bituberous 8½ cm. Labor was spontaneous, with the first stage fourteen hours and forty-five minutes and second stage one hour and ten minutes. Delivery was vertex, low forceps, under cyclopropane, ethylene, and nitrous oxide anesthesia. The infant did not breathe for two to three minutes and was given coramine; breath sounds were poor and the cry was feeble. The baby weighed 8 pounds, 4½ ounces, and lived five hours. Autopsy disclosed bilateral subdural hematomas and a tear in the left side and anterior edge of the tentorium cerebelli.

A twenty-four-year-old primigravida had a normal pregnancy and spontaneous labor, first stage four hours, and second stage fifteen minutes. Measurements were interspinous 23 cm., intercrestal 27 cm., external conjugate 20 cm., diagonal conjugate 12+cm., posterior sagittal 5 cm. Delivery was by breech with forceps to the aftercoming head and anesthesia by means of 1 per cent novocain infiltration and nitrous oxide for five minutes. The infant, weighing 6 pounds, 1½ ounces, gave the first cry at two minutes, and lived for forty-six hours. Autopsy disclosed edema of the scalp and periosteum, extensive laceration of both tentoria with intracranial hemorrhage, and aspiration of meconium.

A thirty-nine-year-old mother (one previous full term infant) had a normal pregnancy and spontaneous labor, first stage six hours and thirty minutes, and second stage one hour and fifty-nine minutes. Presentation was ROP and elective mid-forceps rotation was done to OA. No consultation was sought. Anesthesia was by novocain saddle block. The infant was the second of twins, weighed 7 pounds, 5 ounces, was cyanotic, and had gasping respirations. He lived for twenty-eight hours. Autopsy disclosed bilateral tentorial tears with supratentorial and subtentorial hemorrhage.

A twenty-four-year-old primipara had a normal pregnancy and spontaneous labor, first stage seven hours and fifty minutes, second stage seventeen minutes. Presentation was ROA. At 4:25 A.M., three hours before delivery, the mother was given a paracervical block for backache with 1 per cent cyclaine (31 cc.). About fifteen minutes after the block, the blood pressure became unobtainable and the patient was cold and clammy. The fetal heart rate fell to 70 to 80 and remained so for an hour. At 5:00 A.M. the mother was given 25 mg. ephedrine sulphate, 500 cc. 5 per cent sodium chloride in water with levophed, and her blood pressure rose to 110, with pulse 120. Labor then progressed normally and the infant, delivered by low forceps, weighed 7 pounds, 14½ ounces. He began to cry at about two and one-half minutes and began to have normal respirations at about ten and one-half minutes. The respirations then became jerky and the infant expired at twenty hours of age. Autopsy disclosed purulent pneumonitis. No antibiotics were administered.

A twenty-year-old mother (one previous full term living infant) had a normal pregnancy and spontaneous labor, first stage six hours, second stage twenty minutes. Presentation was shoulder and the infant was born breech, after version with inability to extract the head through an undilated cervix. Ether anesthesia was used (twenty minutes' duration). The infant weighed 6 pounds, 6 ounces, was flaccid at birth, did not breathe, but the heart beat slowly for eight minutes. No autopsy was done. Cause of death was listed as cerebral trauma with anoxia.

A thirty-nine-year-old mother (three previous full term living infants) was Rh negative and during her third pregnancy the anti-Rh titre rose to 1:28 at seven months. The anti-Rh titre was negative during the present pregnancy. The mother had a threatened abortion at three to five months, treated by bed rest, proloid and stilbestrol. The membranes ruptured five days before delivery. No antibiotics were given. The mother had spontaneous labor, first stage two to three hours, second stage ten minutes. Local 1 per cent novocaine anesthesia was used along with nitrous oxide and oxygen at intervals. Presentation was LOA. The infant weighed 5 pounds, 9 ounces, breathed and cried spontaneously. The infant's hemoglobin was 140 per cent, Coombs test was negative. The respirations became irregular and gasping. No antibiotics were given. The infant expired at six hours and nineteen minutes of age. Autopsy disclosed pneumonia with aspiration of infected amniotic fluid. *E. coli* organisms were cultured from the lungs.

A twenty-nine-year-old primigravida was diabetic. Pelvic measurements were normal and prenatal care was uneventful. Labor was spontaneous, presentation was frank breech, first stage lasted six hours, second stage one hour. About forty minutes before birth, the cord prolapsed and the fetal heart tones fell to eighty per minute. No consultation was sought. Cyclopropane anesthesia was given for thirty minutes continuously before birth. The infant weighed 6 pounds, 6½ ounces, condition was poor with gasping respirations and slow heart beat. The infant was given oxygen, 1 cc. metrazol, and placed in an Air-lock, but died after four hours and forty minutes. Autopsy disclosed hemorrhages in capsular surfaces (pleura, epicardium, pericardium adrenal), gross pulmonary hemorrhage, and hyperplastic pancreatic islets.

A thirty-one-year-old primigravida had hypertension from the onset of pregnancy. The urine was negative for albumin until the last month when it was 1+. No records were available as to treatment. The mother was admitted to the hospital on the day before delivery. Blood pressure was 160/100; urine albumin was 3+. Pitting edema was present. Labor was spontaneous, first stage twelve hours, second stage one and one-half hours. The mother had a convulsion one and one-half hours before delivery of the first of twins. Sodium amytal 3¾ grains i.v. was given. No consultation was sought. Anesthesia was nitrous oxide and oxygen. The first twin lived. The second twin was cephalic presentation and high forceps were used. He weighed 7 pounds, 7½ ounces, condition was very poor, and the infant cried two minutes after delivery. The color again became dusky after one hour and respirations were one per minute. Adrenalin and alpha-lobeline

were given and the infant was laryngoscoped and put in the Air-lock. No antibiotics were given. Temperature rose to 105.8° (R) ten hours after birth and a high shrill cry was present along with twitching. The infant expired at sixteen hours and sixteen minutes of age. Autopsy disclosed atelectasis and pulmonary hemorrhage. The mother was in critical condition for two days following delivery, then had a normal recovery.

2. *Two Obstetric-Pediatric Preventable Deaths.*

A twenty-one-year-old mother (one full term living infant, one abortion) had three blood transfusions given after the first delivery. She was thought to be Rh positive at the first delivery, but was found to be Rh negative after the birth of the present baby. The father was Rh positive. The mother had an uneventful pregnancy and spontaneous labor, first stage three hours, eighteen minutes, second stage twenty minutes. Caudal anesthesia was started two hours before delivery and pitocin, 1 minim, was given thirty minutes before delivery. Presentation was ROA, outlet forceps were used. The infant weighed 6 pounds, 13½ ounces, and breathed immediately, although the color was poor and the infant became flaccid and cyanotic. On physical examination moist rales were heard throughout the lungs and a loud systolic heart murmur was heard. A large mass in the abdomen was thought to be the liver. The clinical impression originally was congenital heart disease with decompensation. Laboratory work done on the day of birth revealed a hemoglobin of 5 grams, WBC 33,500, 701 normoblasts per 100 WBC, blood group O, Rh positive (CDe), direct Coombs 1 plus, indirect Coombs 1:128, D albumin 1:64. The diagnosis was considered to be erythroblastosis. The physician felt that the baby could not tolerate an exchange transfusion. The infant received 15 cc. of blood i.v. on the day of birth, later another 50 cc. blood i.v. and at 21 hours the infant received another 15 cc. blood i.v. for a total of 80 cc. blood. Jaundice was noted later on the day of birth which gradually increased and a chest x-ray showed diffuse cardiac enlargement. The infant died at twenty-four hours of age. Autopsy disclosed erythroblastosis with the liver weighing 240 grams (normal 78 grams) and the spleen 30 grams (normal 8 grams). There was a 2x3x6 cm. right subarachnoid hematoma overlying the right frontal lobe. No mention was made of kernicterus.

A forty-three-year-old primigravida was Rh negative. The father's Rh was not done. No anti-Rh tests were done during the pregnancy. Labor was spontaneous, first stage lasting fifty-five minutes and second stage seven minutes. Presentation was LOA, no anesthesia was used. The infant weighed 7 pounds, ½ ounce, and breathed spontaneously. Jaundice developed during the first twenty-four hours of life and increased rapidly. The Coombs test was strongly positive. An exchange transfusion was not done until the day after birth. On the fourth day of life generalized twitchings developed which were interpreted as signs of kernicterus. The infant expired at four days of age. No autopsy was done. The cause of death was listed as erythroblastosis.

3. *Four Pediatric Preventable Deaths.*

A twenty-year-old primipara had a normal pregnancy and spontaneous onset of labor, first stage twenty-three hours, second stage one hour. Presentation was ROP and low forceps were used. Anesthesia was nitrous oxide and oxygen. The infant weighed 7 pounds, 14 ounces. Feedings were started at twenty-four hours of age, and the infant nursed well along with supplemental feedings until the fourth day when it appeared dusky after nursing and the respirations became rapid and shallow. Oxygen was given and a chest x-ray was taken (no information available as to x-ray report). The infant took two subsequent feedings at four hour intervals, but the respirations became quite labored and the color dusky. Clinical impression was possible congenital cardiac anomaly. Several times the infant cried as if in pain and the color became ashen. The same evening the infant was given alpha-lobeline and cedilanid .05 cc. i.m. No cultures were taken or antibiotics given. The infant expired the next morning at four days, twelve hours of age. Autopsy disclosed severe early pneumonia with focal hemorrhages in kidney and lungs and petechial hemorrhages on serous surfaces.

A twenty-four-year-old mother (one previous 2¼ pound stillborn infant) had a normal pregnancy and spontaneous labor, first stage fifteen hours and fifty-five minutes, second stage seven minutes. Presentation was LOP and the infant was manually rotated to LOA. Anesthesia was 1 per cent novocain pudendal block fifty-five minutes before birth. The infant weighed 6 pounds, 10 ounces. He breathed and cried spontaneously. The infant did well until the third day when he began having cyanotic episodes which responded to oxygen. Rhonchi were present in the posterior lung fields. Suctioning produced thick milk containing mucus. The temperature rose to 103° (R), and the infant died at three days of age. No antibiotic therapy was given. Autopsy disclosed lobar pneumonia, subcapsular hemorrhage of the liver, septicemia (*E. coli* organisms cultured from the blood), patent ductus arteriosus, and interatrial septal defect.

A thirty-four-year-old Rh negative mother had previously had four full term infants and one abortion (first pregnancy normal, second pregnancy spina bifida, third and fourth pregnancies erythroblastosis with survival). The father's Rh was not done and no anti-Rh tests were done during pregnancy. The pregnancy was uneventful and the membranes ruptured spontaneously at forty weeks. To induce labor, pitocin was given (one minim) for six doses and five grains quinine for four doses. Five hours after the membranes ruptured, labor began, first stage two hours, second stage seventeen minutes. Anesthesia was nitrous oxide and oxygen. The infant weighed 6 pounds, 10 ounces, and cried lustily after one minute. On the day of birth the infant was found to be Rh positive, 1 nucleated RBC per 100 WBC, total Van den berg 3.4 mgm. per cent, hemoglobin 83.5 per cent. On the day following birth the infant was jaundiced and had slight spastic movements, the hemoglobin was 15.5 grams in the morning but fell to 11.9 grams by afternoon. The infant received 60 cc. of blood i.v. on the day after birth. On the third day the hemo-

globin was 16.8 grams, fourth day 15.5 grams in the morning and 13 grams by afternoon. Profuse orange mucus was suctioned on the fourth day. The infant received no more blood, and expired on the fourth day. No autopsy was done. Cause of death was listed as erythroblastosis.

A twenty-four-year-old primipara was Rh negative. The father's Rh was not recorded. Anti-Rh titre was negative six weeks prior to delivery but was 1:2000 three weeks following delivery. (The mother had received an anti-Rh stimulus several years prior to pregnancy). On the way to the hospital, the mother was involved in an automobile accident, she appeared excited but no injury was found. First stage of labor lasted sixteen and one-half hours, second stage one-half hour. Anesthesia was 1 per cent procaine pudendal block along with trilene with contractions. The infant weighed 3318 grams, breathed spontaneously, did well and was put to breast and nursed fairly well. On the third day it was noted that the infant was jaundiced, Coombs test was negative and the hemoglobin 17 grams (no previous laboratory work). No bilirubin determination was done at any time. On the fourth day the infant's color was dusky and he made grunting noises. No antibiotics were given. The infant expired on the fourth day. Autopsy disclosed kernicterus, bilateral pneumonitis (amniotic fluid aspiration), omphalitis, multiple microscopic abcesses of the pyramids of the kidneys, and suppurative adenitis of a subaxillary lymph node.

Summary and Conclusions

1. The Hennepin County Neonatal Mortality Committee presents a study of the 379 neonatal deaths which occurred in the 20,261 live births in Hennepin County during 1953. The study reveals a neonatal death rate of 18.7 per 1000 live births. Comparative tables for 1952 and 1953 are included with greater amplification by specific birth weights in the latter study.

2. Percentages of deaths in premature and full term infants are similar for both years; in 1952, 70.8 per cent premature and 28.5 per cent full term; in 1953, 71.2 per cent premature and 28.8 per cent full term. Prematurity, thus, is shown to be a major problem in neonatal mortality and is of particular concern to physicians providing obstetric care.

3. Autopsies were obtained in nine out of ten of the neonatal deaths which occurred in 1953, compared to about eight out of ten of those occurring in 1952. However, in 1952, of prematures below 1000 grams 47.3 per cent had autopsies, while in 1953 only 33.6 per cent did so. Since significant anatomic abnormalities may be found even in the so-called previable group, it is important to obtain adequate necropsies not only on larger infants but also on babies under 1000 grams.

4. The distribution of deaths by the age of the mother represent the distribution of total births.

5. Serologic tests for syphilis were done in 72.5 per cent of the pregnancies.

6. Obstetric complications were reported in 37 per cent of the pregnancies in 1953, in 34 per cent of those in 1952; in two-thirds, however, there were no known obstetric abnormalities. Such complications were more common in premature deliveries and were mostly abruptio placentae, placenta previa, undiagnosed types of antenatal bleeding and toxemia. It should be possible in most cases of antenatal bleeding to make a definite diagnosis.

7. 65 per cent of the neonatal deaths were cephalic deliveries, 24 per cent were breech, and 8.4 per cent were cesarean sections. Breech deliveries are most frequent with the smaller prematures where particular care in delivery is necessary.

8. Of the thirty-two sections (8.4 per cent of deliveries), twenty-two were emergency sections because of placenta previa or abruptio resulting in immature infants. Six neonatal deaths were associated with elective section, all of which were immature. Since many elective section babies who are premature do not do well, avoidance of error in judgment in timing is important.

9. The Rh factor was determined in only 70 per cent of the mothers in the study, but should be done in all pregnancies. No ABO incompatibilities were reported. Of the Rh tests made in 1953, 82 per cent of the mothers were Rh positive and 18 per cent were negative; in the 1952 study 23 per cent were Rh negative.

10. Of all neonatal deaths studied, 12 per cent occurred during the first hour of life; almost 60 per cent within the first twenty-four hours; almost 80 per cent within the first forty-eight hours; 15 per cent between two and seven days; and only 5 per cent between eight and twenty-eight days of life. However, if only neonatal deaths of full term infants are considered, only 65 per cent of these died during the first forty-eight hours, 22 per cent between two and seven days and 11 per cent between eight and twenty-eight days of life.

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Case Presentation

Abscess of the Tongue

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OUR recent encounter of an abscess of the tongue in an otherwise normal individual was a new experience to us, and a brief review of some standard text books of surgery, internal medicine and otolaryngology disclosed that this condition is either not mentioned or mentioned very briefly. Once seen, or if one is aware of the entity, it should be readily recognized and appropriately treated. It is because this condition is not frequently encountered that this single case is being reported.

Case Report

The patient was a thirty-six-year-old farmer who was in good health until the night of November 16, 1955, at which time he noted the onset of a small lump in his tongue which was somewhat tender. During the night this increased in size. When seen the following morning (November 17, 1955) the patient had no complaints except those referable to his tongue. Physical examination disclosed a temperature of 98.4°. Findings were limited to the tongue. There was a small walnut sized mass in the middle third of the tongue to the left of the mid line which produced visible bulging both superiorly and inferiorly. This mass was firm and moderately tender. There was good oral hygiene. No external lesions were visible on the tongue or floor of the mouth. There was a small slightly tender lymph node at the angle of the left mandible. The peripheral blood disclosed a white blood count of 11,600, neutrophils 77 per cent, lymphocytes 17 per cent, eosinophils 3 per cent, monocytes 3 per cent. Because the lesion was felt to be inflammatory in origin, the patient was given 800,000 units of procaine penicillin and advised to apply frequent cold liquids to the tongue to limit swelling. He was instructed to return the following day or sooner if evidence of progression occurred.

About 6:00 p.m. the same day (November 17, 1955) the patient returned because of increasing pain, which radiated to his left ear, and swelling of the tongue. These symptoms were accompanied by generalized aches, malaise and chills. Past history was noncontributory. The patient had had recurrent chills and fever after discharge from the service in 1945. He had been stationed in the South Pacific. These episodes were controlled by quinine without a specific diagnosis being made. There was no recent or past evidence of fungus infection in his livestock.

The patient was admitted to the hospital at which time examination disclosed a temperature of 101.2°. The patient appeared flushed and mildly toxic. Speech was impaired because of increased swelling of the tongue. The swelling had become more diffuse and extended now across the mid line. There was an indurated tender area in the middle third of the tongue to the left of the mid line. The lymph node at the angle of the left mandible had increased in size and had become more tender.

Because of the increase of symptoms and the evidence of an infectious process, incision and drainage of the tongue was thought indicated. The impression at this time was either an infected cyst or an abscess of the tongue.

After infiltration with procaine, a stay suture was placed through the tip of the tongue to be used as a retractor.* The left lateral inferior portion of the tongue was infiltrated with procaine and the mucosa was incised in this area. The tongue was probed with a small forceps until a pocket which drained several cubic centimeters of pus was encountered. A small rubber drain was sutured in place. Following this procedure penicillin was continued. The temperature had decreased to 99.4° by the following morning and the patient appeared much improved. Because of a later slight temperature rise, the incision was probed but no further pus was encountered. After thirty-six hours the patient's temperature became normal and remained so. Two days after drainage was carried out the patient was discharged from the hospital. Healing was subsequently rapid, uneventful and complete.

Cultures of the pus found at surgery showed alpha hemolytic streptococci. Further identification of this organism was not carried out. There was no growth of fungi on thioglycollate broth after one month.

Discussion

The most comprehensive report on this condition found in a brief review of the literature was a report from the Netherlands.[1] Huizinga reported forty patients seen in a period of about nineteen years. The symptoms recorded were similar to the above patient. It is interesting to note that thirty-nine of the forty patients were males and

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*Surgery by Dr. L. D. Dawson.

thirty of the group were agriculture workers or farmers. No specific etiology could be implicated. Huizinga recommended that the tongue be explored with a large needle and should an abscess be encountered an incision should be made using the needle as a guide. It is recommended that incision be made as nearly as possible to the mid line to avoid encountering the lingual artery or hypoglossal nerve. Technically working from the inferior surface of the tongue is easier because of the usual marked swelling of the tongue. Even though many of the patients seen by Huizinga were seen before the availability of antibiotics, there was no mortality and no case progressed to edema necessitating tracheotomy. In some instances, all of which were located deep in the base of the tongue, spontaneous rupture occurred. It would seem that if this condition is recognized and incision carried out early, one should anticipate rapid improvement and few complications.

Summary

A case of abscess of the tongue is reported. Therapy should primarily consist of early incision and drainage.

Reference

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X-RAY PELVIMETRY

(Continued from Page 585)

the stereoscopic parallax method of Hodges, was made in a series of forty-nine cases. The variations obtained are presented and compared with those reported by others as resulting from variations inherent in the process of measuring and interpreting pelvimetry films itself. It is concluded that the variability in results obtained by the two methods under discussion is of the same order of magnitude as one might expect with repeated measurement of any pelvimetry film by one individual.

Conclusion

X-ray pelvimetry by the Colcher-Sussman technique is simple, easily understood and applied, inexpensive and acceptable in accuracy. Its use is recommended.

Acknowledgment

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11. Chief causes of death in all neonatal deaths were as follows: immaturity unqualified 30 per cent, atelectasis 21 per cent, congenital anomalies 16 per cent, infection 7 per cent, birth trauma 6 per cent and erythroblastosis 5 per cent. For full term infants only, the chief causes were congenital anomalies 37 per cent, atelectasis 14 per cent, erythroblastosis 13 per cent, infection 13 per cent, trauma 10 per cent.

12. The seventeen obstetric, two obstetric-pediatric, and nine pediatric preventable deaths in the 1953 study are discussed in detail.

13. The collaboration of all specialties is essential in a study of neonatal deaths if all pertinent data of the mother in her pregnancy and labor and of the resulting offspring are to be recorded and critically reviewed. Any inadequacies of facilities or care or errors of omission or commission must be brought to the attention of the practicing physician if continued reduction in infant mortality is to be accomplished.

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Seminar

REACTIONS TO PENICILLIN

I. Review of the Literature Concerning Severe Reactions (English and North American)

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SINCE most physicians today use penicillin in some form, the increasing number of reports of shock and death following its administration prompted us to investigate its relative dangers. Our particular purpose has been to ascertain whether certain preparations and certain routes of administration are more likly to cause severe reactions. We also were interested to discover the incidence of all types of reactions to penicillin at the Mayo Clinic.

Although excellent reviews concerning severe reactions to penicillin are available,[1-4] we found none that summarized the data we sought. Therefore, publication of a compilation of this information appeared justified. As our review of this literature from the English-speaking countries became so voluminous, it became necessary to divide our study into three parts.

This, the first part, deals only with a review of the literature, whereas the second part will deal with the incidence of reactions to procaine penicillin G in aqueous suspension during 1952 and 1953 as compared to the incidence of reactions to procaine penicillin G in aqueous suspension during 1952 and 1953 as compared to the incidence of reactions to a sesame-oil preparation reported in 1948, and the third part will consider the over-all incidence of reactions to penicillin at the clinic in 1952.

We have reviewed the literature from 1943 through June, 1954, emphasizing severe reactions to penicillin with the aim of summarizing the available useful information with regard to the occurrence, prevention and treatment of such reactions. Excluded from this review are the milder cutaneous reactions, adverse sequelae from intrathecal administration of penicillin and the Jarisch-Herxheimer reaction that has been described following penicillin therapy for syphilis. Table I lists the number of severe reactions reported in each of the years in question.

The following review is divided into years to facilitate easy reference.

TABLE I. CHRONOLOGY OF 250 SEVERE REACTIONS TO PENICILLIN

Year Reported	Outcome	
	Fatal	Non-Fatal
1943	0	0
1944	0	0
1945	0	3
1946	2	0
1947	1	1
1948	2	1
1949	1	0
1950	1	4
1951	4	31
1952	6	6
1953	46	110
1954 (through June)	11	20
Total	74	176

1943

In March, 1943, the Floreys[5] reported on the first 172 patients treated with penicillin; they observed no toxic symptoms attributable to the drug. The first reactions after administration of penicillin were described in the reports of Keefer and associates[6] and Lyons,[7] which appeared late in 1943. None of the reactions observed were considered serious. Lyons was the first to mention the sudden unpleasant taste in the mouth that subsequently has been reported often in conjunction with the more severe reactions to penicillin.

1944

Severe reactions also were not reported in 1944. However, Welch and Rostenberg[8] observed positive results of skin tests with therapeutic forms of penicillin among patients who never had received the drug. Feinberg[9] noted that patients who displayed cutaneous sensitivity to the molds from which penicillin was derived were not necessarily allergic to penicillin itself.

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1945

The first case of anaphylactoid shock following penicillin therapy was reported by Cormia and associates.[10] This patient, twenty minutes after receiving an intramuscular injection of penicillin, became unconscious for fifteen minutes. Another patient, who continued to receive penicillin topically despite a mild urticarial reaction, became semiconscious within twenty-four hours; pulmonary edema developed before he recovered. Both these patients had received penicillin previously. Price and co-workers[11] described severe asthma developing late in the course of penicillin therapy.

1946

Wilensky[12] reported on the first patient whose death was attributed to penicillin, a middle-aged man in whom subtotal gastrectomy was performed. Penicillin in a dose of 30,000 units given intramuscularly every four hours was used as a prophylactic measure postoperatively. After five days of therapy, fever and a scarlatiniform rash appeared and the patient died on the seventh day after operation. Spain and Clark[13] described a patient whose leukocyte count decreased to 100 cells per cubic millimeter of blood on the third day of a cutaneous reaction that was attributed to penicillin. Administration of penicillin was stopped and the leukocyte count increased to 10,700 just before death. However, this patient also received 6 gm of a sulfonamide drug. O'Donovan and Klorfajn[14] noted mild shock after intramuscular administration of 15,000 units of penicillin to a patient who had received penicillin topically During later desensitization, a dose of 100 units of penicillin given subcutaneously produced mild shock. However, 15,000 units of penicillin was taken orally thirteen days later without evidence of reaction.

1947

Anderson[15] reported the occurrence of intestinal purpura, arthralgia and toxic nephritis in a patient two days after completion of a nine-day course of penicillin. This patient had received penicillin previously, and there was a family history of asthma. Templeton, cited by Florey,[16] reported a death owing to penicillin therapy.

1948

Brown,[17] in a detailed and excellent review of the side effects of penicillin recorded from 1943 to 1948, observed that anaphylactoid responses were not reported when use of penicillin was continued in the presence of reactions to it. Anderson and Keefer[18] summarized their experiences with penicillin in 10,420 patients and found the incidence of reactions (exclusive of local forms) to be 6 per cent; this included 1.6 per cent who had urticaria, 0.85 per cent who had fever and 0.02 per cent who had asthmatic symptoms owing to use of penicillin. Sawicky and Rein[19] reported anaphylactoid shock after the intramuscular administration of 300,000 units of penicillin in oil and wax to a patient who previously had experienced a generalized cutaneous eruption after topical application of penicillin. Barksdale and co-workers[20] reported exfoliative dermatitis and death after penicillin was given intramuscularly to a patient with a history of a previous reaction to penicillin. Berk and Sostek[21] described a patient who had an eosinophilia of 21 per cent after administration of penicillin without any other evidence of reaction; the eosinophilia was reproducible. Rabinovitch and Snitkoff[22] reported on a patient who died fifteen days after the onset of exfoliative dermatitis that was attributed to penicillin.

1949

Waldbott[23] reported the first instance of sudden death owing to penicillin—an asthmatic patient in whom shock developed five seconds after 50,000 units of penicillin was given intramuscularly. Falk and Newcomer[24] reported that Löffler's syndrome occurred in patients treated with penicillin in oil and wax. A careful study by Lepper and associates[25] showed that the incidence of reactions to crystalline penicillin increased with larger doses. They found reaction rates of 1.2 per cent after injection of aqueous crystalline penicillin G, 2.7 per cent after use of penicillin in oil and beeswax, and 1.4 per cent after administration of procaine penicillin G in oil. Immediate shock reactions did not occur in their series of 1,303 cases. According to their review of the literature, 18 per cent of patients who reacted to penicillin gave histories of allergy and 80 per cent had received penicillin previously.

1950

Burleson[26] reported anaphylactoid shock occurring in a penicillin-sensitive patient fifteen minutes after the intramuscular administration of 200,000 units of procaine penicillin. Berne[27] described a patient who died as the result of ex-

foliative dermatitis after intramuscular administration of penicillin in oil and wax. This patient was sensitive to penicillin and also received a sulfonamide with the penicillin. The Felders[28] described a reaction manifested by urticaria, myocarditis and hepatitis that developed fourteen days after the patient received penicillin in sesame oil four times daily for ten days. Leibowitz and Schwartz[29] reported a case of anaphylactoid shock after aerosol treatment of an asthmatic patient and mentioned another similar case. Zussman[30] questioned the value of antihistaminic therapy for reactions resembling severe serum sickness, and cited Dreisbach's[31] observation of the failure of diphenhydramine hydrochloride (Benadryl®) and tripelennamine hydrochloride (Pyribenzamine®) to prevent experimental cutaneous sensitization to penicillin and horse serum.

1951

Siegal[32] concluded that administration of penicillin need not be discontinued when patients exhibit mild or moderate reactions, and that penicillin is tolerated by the great majority of patients who give histories of a single previous allergic reaction to penicillin. He distinguished between permanent and transient sensitization and cited Risman and Boger[33] to the effect that two-thirds of patients sensitive to penicillin G also are sensitive to penicillin O as indicated by results of skin tests. Anderson[34] reported on three patients who required tracheotomy for laryngeal edema one to six days after penicillin therapy; one patient received penicillin orally and the other two received it intramuscularly. Panja and Banerjee[35] described fatal exfoliative dermatitis in a thirty-three-year-old woman who was sensitive to both penicillin and streptomycin and who also gave a history of asthma.

Gold[36] speculated on the role of penicillin in the pathogenesis of systemic lupus erythematosus and observed that three of his eight patients with this disease were made worse by penicillin. Mirabel[37] described a sixty-year-old man in whom nonthrombocytopenic purpura of the Henoch-Schönlein type, acute nephritis and angioneurotic edema developed after his first injection of penicillin. The purpuric manifastations lasted six months. Humphreys[38] reported immediate convulsions in a patient who received 300,000 units of procaine penicillin intramuscularly. Criep and Cohen[39] reported four cases of nonthrombocytopenic purpura attributable to penicillin. Corajod and associates[40] reported a case of anaphylactoid shock and death due to penicillin. Epstein[41] reported chronic urticaria lasting three to fifteen months after penicillin therapy; four of the six patients affected received procaine penicillin and two never had received penicillin previously. Several patients threatened to commit suicide because of the urticaria. A correspondent to the *British Medical Journal*[42] mentioned a fourteen-month-old girl who received penicillin intramuscularly after a mild burn and died five days later; necropsy revealed pericardial effusion and tamponade.

Batchelor and co-workers[43] described eight alarming reactions to procaine penicillin in aqueous suspension in a series of 398 patients treated for syphilis. Immediately after intramuscular injection, all eight became weak and several expressed a fear of impending death; shock did not develop. Six of the eight had unusual fatigue for the following week. Five received subsequent injections without reaction. Everett[44] reported two and mentioned four more cases of shock following use of 300,000 units of procaine penicillin G in peanut oil given after antral lavage with a solution of penicillin. Irwin and associates[45] described non-fatal anaphylactoid shock after 300,000 units of procaine penicillin G was administered to a patient who previously had demonstrated sensitivity to penicillin. Lapin and Mond[46] reported on two children, aged four and five years, respectively, in whom an "encephalitic syndrome with myocarditis and nephritis" developed after oral use of penicillin. These authors cited Hansel to the effect that sensitivity to penicillin may disappear or gradually decrease over a period of six months to a year, or may increase with each subsequent attack. Adelson[47] reported on a four-month-old child in whom the first oral course of penicillin caused urticaria and death in twenty-two days due to periarteritis nodosa. Spring[48] described a fifty-three-year-old man in whom nonthrombocytopenic purpura and nephritis developed twenty-four hours after he received 300,000 units of procaine penicillin intramuscularly; the purpura lasted for six weeks.

1952

Three patients who experienced anaphylactoid shock after administration of penicillin were reported on by Yuval,[49] Yoder and Lyaander[50] and

Stroud.[51] These reports were included in Florey's[5] excellent review of reactions to penicillin. Wilson[52] reported on a thirty-seven-year-old man who had received penicillin uneventfully three years previously and who experienced edema and tightness in the thorax fifteen minutes after intramuscular injection of aqueous procaine penicillin G. Harkavy[53] reported death of two patients in whom purpura and arterial changes were attributed to penicillin; necropsy in one case showed arteritis and acute hepatic necrosis. Waugh[54] described necropsy findings of myocarditis, arteritis and focal hepatic, splenic and renal granulomas in a sixty-year-old-man who had a cutaneous eruption attributed to penicillin. However, this patient also received a sulfonamide and streptomycin during the course of treatment.

Thomson[55] described sudden shock and death after intramuscular administration of 300,000 units of crystalline penicillin G in a sixty-seven-year-old patient who had recovered one month previously from an immediate anaphylactoid shock after receiving an intramuscular injection of procaine penicillin G. Harpman[56] reported on a three-year-old child who became unconscious within one hour and died within three and one-half hours after receiving an intramuscular injection of procaine penicillin. This child had received penicillin previously without reaction, and there was no history of allergy. Necropsy revealed changes consistent with an anaphylactoid reaction. This author also described immediate nonfatal shock and convulsions occurring in a patient during intramuscular injection of procaine penicillin.

Higgins and Rothchild[57] reported anaphylactoid shock and death ten minutes after an injection of 300,000 units of procaine penicillin G given routinely after an operation. The patient had no history of allergy and had received penicillin previously without evidence of sensitivity.

1953

Walsh and Zimmerman[58] demonstrated the L. E. phenomenon in three of six patients in whom sensitivity to penicillin developed. Reichlin and co-workers[59] reported Löffler's syndrome after intramuscular administration of penicillin. Siegal and associates[60] reported death in an asthmatic patient almost immediately after the intramuscular injection of 300,000 units of aqueous procaine penicillin; this patient had received penicillin previously without reaction. Immediate severe nonfatal anaphylactoid reactions in two patients also were mentioned; one of these patients had received aqueous procaine penicillin intramuscularly. Mayer and co-workers[61] reported sudden death after 300,000 units of aqueous procaine penicillin was given intramuscularly to a patient who previously had fainted after taking a penicillin troche for an infection of the upper part of the respiratory tract. Five other patients, who had almost immediate anaphylactoid shock with recovery, also were described. All six of these patients had received penicillin on previous occasions, and four had experienced reactions. Passive-transfer tests demonstrated circulating antibodies for penicillin in four of the five patients so studied. None reacted to procaine. One patient later received 10 units of penicillin intradermally and collapsed; blood pressure was not obtainable for fifteen minutes. This patient experienced the same strange taste in his mouth that had occurred during his previous reactions to penicillin.

Christenson and associates[62] reported an immediate fatal reaction after 300,000 units of procaine penicillin was given intramuscularly. This patient had no allergic history but had used an ophthalmic ointment containing penicillin eighteen months previously. Chapman and Metheny[63] described a sixty-three-year-old patient who became unconscious within five minutes after he received 300,000 units of aqueous procaine penicillin before an operation. He recovered in ninety minutes, after which it was learned he had experienced a reaction to penicillin more than a year previously. Nikishin[64] reported shock five minutes after an intramuscular injection of 300,000 units of procaine penicillin G. The patient's treatment included use of norepinephrine, and recovery occurred in twelve hours; an allergic history was absent but the patient had received penicillin previously without reaction. Curphey[65] reported sudden death in two asthmatic patients; death occurred in one after 300,000 units of aqueous procaine penicillin was given intramuscularly, whereas the other patient received 400,000 units of crystalline penicillin with 0.5 gm. of streptomycin. One patient had received penicillin four years previously without reaction and the other was known to be allergic to penicillin in oil.

Geraci and Manning[66] reported the use of penicillin O in the treatment of subacute bacterial endocarditis in three patients who were sensitive

to penicillin G. Although mild reactions developed in these patients, the treatment was successful. Feinberg and associates[2] reported on four patients who died almost immediately and two who experienced nonfatal anaphylactoid shock as the result of penicillin. The condition in another patient described by this group appeared identical to that of the one reported by Christenson and co-workers. In addition, they reported a death following immediately after inhalation of penicillin powder. Two patients were known to have had previous reactions to penicillin and one had asthma. One received procaine penicillin in peanut oil and one received crystalline penicillin G intramuscularly. One of the patients, a soldier with a wound of the elbow, died four hours after the intravenous administration of penicillin. This occurred in February, 1944, and is the only reported fatality attributable to the intravenous use of penicillin. It is of interest that morphine was administered while the patient was in shock and that thrombosis of the axillary vein was found at necropsy.

Within a period of five weeks in his practice, Larsen[67] observed two patients who experienced anaphylactoid shock from penicillin. Both had received penicillin previously without reaction. One patient was given 600,000 units of procaine penicillin G and the other received 400,000 units of penicillin with 0.5 gm. of streptomycin. Subsequent skin tests revealed positive reactions to penicillin but no reactions to procaine. Mignault and Mitchell[68] reported anaphylactoid shock within five minutes after an intramuscular injection of procaine penicillin, with recovery after unconsciousness for twelve hours. Results of subsequent skin tests with procaine and crystalline penicillin were negative but cutaneous sensitivity to procaine penicillin was noted. Whipple[69] recorded acute anaphylactoid shock after intramuscular administration of aqueous procaine penicillin G; nine days of bloody diarrhea followed this reaction. The author considered that the patient subsequently had acute ulcerative colitis and acute ulcerative cystitis as a result of the penicillin.

Collins-Williams and Vincent[70] added reports of two immediate fatal and six severe nonfatal reactions from penicillin. Neither of the patients who died was known to have asthma. Results of skin tests were positive in three of seven adults known to be sensitive to penicillin. One patient who experienced a mild immediate constitutional reaction had an absence of cutaneous sensitivity to penicillin one year later. Wofford[71] reported shock three minutes after penicillin was administered intramuscularly to a pregnant woman who had received penicillin previously without reaction.

Sohval[72] suggested that the severe immediate reactions following administration of penicillin could be divided into two categories, namely (1) anaphylactoid shock and (2) weakness-fear reaction. His case is illustrative of the latter type and is similar to those reported by Batchelor's group, in 1951. A fifty-six-year-old man had received penicillin previously, with a questionable reaction. After the third injection, given in February, 1953, he experienced vertigo, a metallic taste in the mouth, tightness in the thorax, pallor, tachycardia and angor animi. Shock did not develop and, although no treatment was given, recovery ensued in fifteen minutes.

Banerjea and Roy[73] reported three deaths owing to exfoliative dermatitis in patients receiving penicillin. One patient was given diphtheria antitoxin coincident with aqueous penicillin; enterocolitis developed before death occurred thirty-two days later. Another patient died from associated "coronary thrombosis" and the third died two months after aqueous penicillin was given. A correspondent to the *British Medical Journal*[74] reported on a forty-one-year-old woman who died one hour after 400,000 units of procaine penicillin was given intramuscularly. Icasiano[75] reported an almost fatal anaphylactoid shock reaction after use of penicillin.

Boger and co-workers,[76] in a panel discussion, emphasized the unpredictability of severe reactions to penicillin and stated that there was no evidence to implicate procaine by itself as the cause of such reactions. The same panel also mentioned a fatality after an intradermal test for sensitivity to penicillin. In the prevention of severe reactions, these authors suggested (1) avoidance of needless sensitization, (2) employment of oral preparations of penicillin for mild infections, (3) inquiry concerning history of previous reactions to penicillin, (4) use of a tourniquet above the site of injection, with a pause of forty-five seconds after the first several drops are injected, and (5) use of the scratch test, employing an aqueous solution of penicillin G containing 10,000 units per cubic centimeter, with a wait of fifteen minutes if testing for cutaneous sensitivity is to be done.

Weiss[77] described shock after the antral instillation of crystalline penicillin G in a nonallergic patient who previously had shown sensitivity following oral administration of penicillin; results of skin tests for sensitivity to penicillin were negative fourteen months later and aerosolized penicillin was tolerated without reaction.

Herrell[78] stated that the incidence of cutaneous reactions to penicillin is minimal with preparations of procaine penicillin. Alexander[79] discussed desensitization of the penicillin-sensitive patient and emphasized that not all patients who have reactions require desensitization, because the sensitivity in some is transient. To desensitize, he often started with doses of 250 units given intramuscularly four times a day; the individual doses on each succeeding day were doubled until the required dosage was reached and the program was not discontinued if minor reactions occurred.

Because of the mounting number of reported severe reactions, Welch and associates[4] surveyed the records of ninety-five hospitals with a total of 51,000 beds and found data concerning fifty-nine previously unreported acute anaphylactoid reactions to penicillin; nineteen of these reactions were fatal. The injection of procaine penicillin accounted for thirty-seven of the nonfatal and eighteen of the fatal reactions found in their study; two nonfatal severe reactions occurred after use of penicillin O, whereas one nonfatal reaction was due to penicillin G diethylaminoethyl ester (Neopenil®) and one death was attributed to oral use of benzathine penicillin G. In addition, they cited the Smith, Kline and French report of twenty anaphylactoid nonfatal reactions and five fatal reactions. It was their opinion that this preparation (Neopenil) is toxic out of proportion to its use. The same authors mentioned six additional nonfatal severe reactions to penicillin of which they were personally aware; one of these reactions was due to an oral preparation. Pick and Patterson[80] reported a death five minutes after 500,000 units of penicillin G diethylaminoethyl ester (Neopenil) was administered to an asthmatic patient who had felt faint after a similar injection the day before.

Kern and Wimberley[3] reported two immediate fatal reactions and one nonfatal reaction after intramuscular injection of penicillin. Their review of the literature gave evidence that penicillin had replaced serums as the commonest cause of anaphylactoid shock. They considered that repository forms of penicillin induce sensitivity oftener and in more severe degree than do other preparations. They were convinced of the role of penicillin as a cause of fatal vascular allergy and mentioned two cases of this type seen by them. Morgan and Cronhelm[81] reported three immediate severe reactions, in one of which shock developed, after intramuscular administration of penicillin.

Farmer[82] reported on four patients who had asthma and severe giant urticaria after injection of procaine penicillin. Two were known to be asthmatic and one was sensitive to procaine. It was his opinion that skin tests are unreliable and that a careful history is more important. He considered that desensitization by the oral method is inadequate and that antihistamines are disappointing in the prevention or management of these reactions. Pryor and Burrell[83] reported one death and two immediate nonfatal reactions with shock after intramuscular administration of procaine penicillin. Two patients had received penicillin previously without reaction and two gave a history of urticaria after ingestion of certain foods.

Sterling[84] stated that further penicillin therapy is contraindicated if any of the following symptoms occur after its use: (1) syncope or a feeling of faintness recurring for three hours after injection; (2) sensation of burning or heat throughout the body; (3) local or generalized pruritus never before present and beginning within a few hours after the injection; (4) choking sensation in the throat; and (5) severe paroxysmal pain varying in location, such as in the precordium or epigastrium. Sterling administered penicillin to three patients who fulfilled one of these criteria and produced anaphylaxis in all three. Skin tests are unreliable, in his opinion, because they give false positive as well as false negative reactions.

Beck[85] described the successful treatment by means of penicillin of subacute bacterial endocarditis in a penicillin-sensitive patient who had had two relapses after other antibiotic treatment. A mild rash developed on the eight day of therapy; however, treatment was continued for a total of thirty days.

Altounyan[86] reported a death fifteen minutes after intramuscular administration of penicillin to a patient who recently had experienced a severe reaction to morphine. Anaphylactoid shock

in a patient after the injection of procaine penicillin also was mentioned.

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Madalin[87] reported anaphylactoid shock after a lozenge that contained penicillin was in the mouth only two minutes. Bell[88] reported sudden death attributable to intramuscular use of procaine penicillin G in a nonallergic patient who had received penicillin previously without reaction. He cited three other cases of nonfatal shock due to procaine penicillin. An editorial in the same issue of the *Lancet*[89] remarked that procaine penicillin may be likely to produce reactions because it is not merely procaine plus penicillin but is a new compound, Rostenberg and Webster[90] discussed the mechanisms of cutaneous reactions to drugs, especially those owing to antibiotics. Glotzer[91] described a forty-three-year-old man in whom a generalized eruption developed after oral use of penicillin; although he did not have cardiac symptoms, all electrocardiographic leads displayed inverted T waves that persisted for a week. Binder and associates[92] reported similar changes in three patients in 1950. Collins-Williams and Ratner[93] mentioned Blanton's case of anaphylactoid shock due to oral use of penicillin and stated that delayed reactions to penicillin are less likely to confer permanent sensitivity than are immediate reactions.

Rosenthal[94] reported eight immediate deaths from intramuscular administration of penicillin, seven of which were due to procaine penicillin. The injections in two patients were not authorized by a physician. One of the patients was eighteen months of age and had not previously received penicillin. One was known to be sensitive to penicillin.

Smith and associates[95] noted six reactions to single intramuscular injections of benzathine penicillin G in 700 patients, an incidence of 0.9 per cent. Two of these six reactions were immediate shock reactions and were reported by Grekin and O'Brien.[96] One was in a nineteen-year-old girl in whom shock developed three minutes after 600,000 units of benzathine penicillin G was given; this patient recovered within two hours and recalled the occurrence of nausea and hives after an intramuscular injection of penicillin four years previously. The other shock reaction was in a fifty-three-year-old woman who was recovering from a serum-sickness type of reaction to procaine penicillin in oil when she received 3,000,000 units of benzathine penicillin G intramuscularly. She experienced shock and was apneic; artificial respiration was required before recovery was complete in five hours.

Finke[97] reported immediate shock after intramuscular administration of penicillin in thirteen patients, five of whom had noted asthmatic symptoms previously. These thirteen comprised 3 per cent of patients who had bronchitis or asthma and who were being treated with penicillin on a long-term basis. The same author also reported a death after use of procaine penicillin in an elderly man with status asthmaticus. He further observed that the incidence of complication after penicillin therapy was not greater in asthmatic patients than it was in those without asthma. Carter and Cope[98] reported on a patient who had immediate anaphylactoid shock after the application of an ophthalmic ointment containing penicillin; this patient had experienced tightness in the thorax and wheezing immediately after receiving penicillin intramuscularly three months before.

Brodey and Nelson[1] reported the successful use of cortisone and antihistamines with penicillin in the treatment of a patient who had syphilis, who was sensitive to penicillin and who had relapsed during other treatment.

Fisher[99] reported on a twenty-eight-year-old man who experienced shock five minutes after receiving 300,000 units of aqueous penicillin intramuscularly; death occurred in forty-five minutes despite vigorous therapy. This patient had undergone spinal anesthesia produced by 150 mg. of procaine without reaction several hours earlier for an operation on a hammer toe. The penicillin was given as a routine postoperative measure. There was a history of local reactions to procaine, but he had received penicillin previously without untoward effect.

Comment

The 250 severe reactions to penicillin reported in the literature we reviewed from 1943 through June, 1954, are classified in Table II. While such reactions are relatively rare considering the monthly production of more than thirty tons of penicillin, yet one physician, as already mentioned, observed two instances of anaphylactoid shock owing to penicillin in a five-week period. We would like to emphasize that extremely few of the

TABLE II. CLASSIFICATION OF 250 SEVERE REACTIONS TO PENICILLIN

Type	Outcome		Total
	Fatal	Non-Fatal	
Acute	58	152	210
Delayed	16	24	40
Total	74	176	250

TABLE III. NATURE OF 40 SEVERE DELAYED REACTIONS TO PENICILLIN

Type of Delayed Reaction	Outcome		Total
	Fatal	Non-Fatal	
"Vascular allergy" (purpura, myocarditis, arteritis)	10	15	25
Exfoliative dermatitis	6	0	6
Asthma and pulmonary edema	0	6	6
Laryngeal edema—tracheotomy	0	3	3
Total	16	24	40

TABLE IV. ROUTE AND PREPARATION IN 250 SEVERE REACTIONS TO PENICILLIN

Route and Preparation	Outcome		Total
	Fatal	Non-Fatal	
Intramuscular			
Penicillin*	13	18	31
Procaine penicillin	5	25	30
Aqueous suspension of procaine penicillin G†	45	93	138
Neopenil (penicillin G diethylaminoethyl ester)	6	21	27
Penicillin O	—	2	2
Compenamine (1-ephenamine penicillin G)	—	1	1
Bicillin (benzathine penicillin G)	—	2	2
Oral			
Penicillin	1	5	6
Bicillin (benzathine penicillin G)	1	—	1
Aerosol	1	2	3
Antral irrigation	—	1	1
Topical	—	2	2
Lozenge	—	1	1
Intracutaneous skin test	1	1	2
Intravenous	1	2	3
Total	74	176	250

*Includes amorphous and crystalline preparations, and those in oil and beeswax.
†Exact nature of preparation used not always stated but in most nstances it was the aqueous suspension.

patients who had these reactions were critically ill until they received penicillin. The authors reporting these reactions were uniformly vehement concerning the indiscriminate use of penicillin.

The acute severe reaction, generally regarded as anaphylactoid, usually occurs within thirty minutes after the administration of penicillin, irrespective of route, preparation or dose. It may be manifested first by a dryness or strange taste in the mouth, angor animi, weakness, nausea or tightness in the thorax, and it may be followed by collapse, shock or unconsciousness. Pulmonary edema, laryngeal edema, cyanosis, convulsions and death may supervene. The nonfatal reactions may be followed by weakness for many days. Most of the acute nonfatal reactions noted in Table II progressed to shock; the remainder, sometimes referred to by the afore-mentioned term "weakness-fear reactions," ceased before collapse occurred.

The duration of these acute reactions is so variable that it is difficult to assess the merits of the individual measures employed in their treatment. Some patients recover without treatment. It is obvious that the relation of the reaction to the administration of penicillin should be recognized and administration of the drug should be stopped immediately. Treatment ordinarily begins with use of epinephrine, and an antihistaminic agent is usually given intravenously. Apnea is treated by insuring a clear airway, use of artificial respiration and the administration of aminophylline and other respiratory stimulants. Oxygen, blood or blood-volume expanders are needed if shock persists. Norepinephrine, corticotropin (ACTH) and cortisone have been given with apparent benefit. Vigorous efforts are justified when the patient does not respond immediately, because in several instances recovery has ensued after unconsciousness for twelve hours.

The nature of the severe delayed reactions encountered in our perusal of the literature is noted in Table III. It is sometimes difficult to establish a causal relationship between these severe delayed reactions and penicillin for two reasons. In the first place, the so-called reaction actually may be a complication of the disease for which penicillin was given. Secondly, other drugs administered to the patient during the course of the illness also might be responsible. The onset of these delayed reactions is often apparent several days after the penicillin is first given. Reactions of this type occasionally are not recognized and the use of penicillin is continued. This difficulty can be avoided if it is kept in mind that penicillin may contribute to the persistence of fever, may cause petechiae or other purpuric manifestations, may aggravate a pre-existing dermatosis or, rarely, may cause unusual weakness, asthma or shock.

It is evident from Table IV that any preparation of penicillin or route of administration is capable of causing severe reactions. The frequency with which the various preparations are

used undoubtedly plays a part in the reported incidence of severe reactions to each of them.

Procaine penicillin G in aqueous suspension given intramuscularly, the most frequently used preparation and route of administration, is responsible for more than half of the severe reactions recorded in the literature thus far. While details of the precise nature of the preparation of procaine penicillin used sometimes are not mentioned in the reports, it is assumed that the majority of reactions have followed the use of the aqueous suspension. This assumption appears justified because the adjuvants of beeswax and oil have been used only to an extremely limited extent in the United States since early in 1951, and it is clear from Table I that the majority of severe reactions have been reported since that time. As indicated previously, procaine penicillin is a chemically discrete compound; therefore, procaine by itself probably is not the cause of the reactions. Moreover, no patients of whom we are aware who experienced an immediate severe reaction and subsequently were tested for cutaneous sensitivity to procaine have shown positive reactions to this material. Furthermore, the sudden strange taste in the mouth reported to occur so often with acute severe reactions to penicillin has not been noted in association with toxicity from procaine.

Benzathine penicillin G (Bicillin®) for intramuscular use does not appear at this time to be less toxic than procaine penicillin in aqueous suspension injected intramuscularly. Furthermore, it must be remembered also that preparations of penicillin which produce adequate levels in the blood for long periods may make the treatment of a delayed reaction extremely difficult. Cross reactions between penicillin O (the so-called hypoallergenic penicillin) and penicillin G appear to be the rule rather than the exception. This may be due in part to the presence of small amounts of penicillin O in preparations of penicillin G and vice versa. Penicillin G diethylaminoethyl ester (Neopenil) for intramuscular use is toxic out of proportion to the incidence of its use and is no longer available.

It has been stated that accidental intravenous injection of a preparation designed for intramuscular use might account for the production of severe reactions. However, this does not explain the severe reactions that have followed other routes of administration of penicillin. For the same reason, the sudden taste in the mouth is not attributable to toxicity as a result of accidental intravenous injection, because these phenomena have occurred when penicillin is given topically and intracutaneously. The purposeful intravenous use of penicillin has resulted in relatively few severe reactions (one fatal and two nonfatal); furthermore, it should be noted that these episodes occurred before 1948 and the role of penicillin in their production is questionable. Thus, we have encountered only one report of a death due to intravenously given penicillin and the cause of death in this case is open to question. This is of significance, for the intravenous route of administration has been employed frequently since the introduction of penicillin, in 1943.

The oral administration of penicillin has accounted for two fatal and five nonfatal severe reactions. We consider that the dangers of oral use of penicillin have not been sufficiently emphasized for the following reasons: (1) it may sensitize patients to the subsequent intramuscularly given shock dose; (2) it is likely to be employed for minimal indications; and (3) its sensitization of the patient frequently may pass unnoticed, especially if the reaction is limited to the mucous membranes.

Although fallible, the history of sensitivity to penicillin is probably the most useful single aid in the anticipation of severe reactions, which occur most commonly in patients who have exhibited clinical sensitivity to penicillin, regardless of whether the induction of such sensitivity was recent or remote. It is important to ascertain the nature of the previous reaction and to verify, when possible, that it was due to penicillin and not to other drugs given during the same illness. The risk of severe reaction appears to be increased if the previous one was immediate, generalized or severe. Conversely, the risk may be less if the reaction was delayed, localized or mild. However, severe reactions have been reported after the first administration of penicillin (spontaneous sensitivity). Furthermore, the absence of a clinical reaction to penicillin given in the past does not preclude the possibility of a severe reaction the next time it is given (latent sensitivity). On the other hand, some patients have tolerated penicillin well even after experiencing a severe reaction (transient sensitivity).

Although the patient's age and allergic status

and the results of skin tests for sensitivity to penicillin are frequently mentioned, they actually are not of much value in the prediction of severe reactions. With regard to age, death occurred in five children less than six years of age, whereas two children had nonfatal severe reactions to penicillin. The remainder of the reactions occurred in adults. Asthma, or a history of it, was found in only 24 per cent of the patients who experienced these 250 severe reactions. The skin test for sensitivity to penicillin has not given consistently practical clinical information because of false negative and false positive reactions, as already indicated. Indeed, the intracutaneous test has caused shock and death, although the scratch test is regarded as safe at this time.

Penicillin should be withheld from those patients whose prognosis would appear to be favorable without it. This is especially true of the patient who gives a history of a reaction to penicillin of any degree of severity. If, however, the prognosis would appear to be unfavorable without the administration of penicillin and if sufficient reason exists to suggest the possibility of danger from the penicillin itself, then desensitization, epinephrine in oil, antihistamines and cortisone might be tried in an effort to prevent, minimize or suppress reactions. Simultaneous administration of an antihistamine with penicillin does not prevent immediate severe reactions because there is insufficient time for the drug to exert any protective action; moreover, experimental evidence indicates that antihistamines probably do not prevent sensitization to penicillin. It has been suggested that injections of penicillin be given in a location which would allow a tourniquet to be placed above the site of administration of repository penicillin in the event of a severe reaction.

While information in the literature is meager concerning the relative risk of the continuation of penicillin therapy in the presence of a reaction, it is known that shock, death and exfoliative dermatitis occasionally may supervene. Therefore, administration of penicillin should be discontinued if a severe reaction develops. It is equally clear that the milder reactions may subside, with or without adjuvant therapy, even though use of penicillin is continued. However, in the penicillin-sensitive patient, the clinician must proceed cautiously, weighing the danger of the disease against the danger of further use of penicillin.

Summary and Conclusions

A total of 250 severe reactions to penicillin has been reported in the literature from English-speaking countries through June, 1954; seventy-four of these have been fatal.

Penicillin in any form or administered by any route apparently may produce anaphylactoid shock and death, regardless of the patient's previous experience with penicillin or the allergic status or age.

The acute anaphylactoid reaction that follows use of penicillin may occur within several seconds to thirty minutes. Recovery may be immediate and spontaneous or may follow the vigorous treatment of shock for as long as twelve hours.

Measures recommended for treatment of the acute shock reaction include use of epinephrine, maintenance of a clear airway and administration of oxygen; in addition, use of antihistaminic agents given parenterally, aminophylline, norepinephrine, cortisone, corticotropin (ACTH) and blood-volume expanders may be helpful.

Although limited in value, a history of sensitivity to penicillin is the most useful single aid in the anticipation of severe reactions to penicillin.

Penicillin should be used with great caution, if at all, for a patient who has previously experienced a severe reaction to penicillin.

The use of penicillin may cause death; therefore, it must be used judiciously and not indiscriminately.

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Continuation Studies

GLAUCOMA AND THE FAMILY DOCTOR

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Glaucoma means potential blindness. Eye symptoms and eye problems are with us at every turn and it is impossible to be a family doctor, an internist, or a pediatrician, without frequently having to consider eye symptoms and give advice on eye problems. I ask that the family doctor keep glaucoma in mind as he does his day-to-day work of caring for his patients for, as with many conditions, to think of the disease entity is a large step in making the diagnosis.

Glaucoma is a common cause of blindness. There are 260,000 blind in this country. One out of every eight blind persons has lost his vision because of glaucoma. It is estimated that one out of every fifty persons over forty years of age has glaucoma. Most of these cases are undiagnosed. This means that there are 800,000 people in the age group over forty years of age who are losing their vision due to glaucoma. Many of these patients with undiagnosed glaucoma will consult their family doctors because of vague eye symptoms or for other eye advice. Case finding in glaucoma by the family doctor can be a tremendous help in preventing blindness. It is important that these patients be considered seriously and advised properly and not be permitted to lose valuable time by drifting into the hands of nonmedical practitioners to be treated with eye glasses and eye exercises.

Definition

Glaucoma may be defined as an increase in the intraocular pressure which the eye cannot tolerate without injury to its inner structures and impairment of its visual function. Glaucoma is not a disease entity but rather a whole complex of diseases which have as their common feature an abnormal elevation of the intraocular pressure.

Classification

I. Congenital and juvenile primary glaucomas caused by developmental anomalies.
   A. Congenital primary glaucoma.
      1. Hydrophthalmia.
      2. Glaucomas associated with aniridia, neurofibromatosis, etc.
   B. Juvenile glaucoma, developmental anomalies.

II. Secondary glaucoma. Glaucoma as a complication of some other disease or damage to the eye.

III. Primary glaucoma. Glaucoma of unknown or poorly understood mechanism.
   A. Open angle glaucoma. Filtration angle of the anterior chamber is of normal width.
   B. Narrow angle glaucoma.

When to Suspect Glaucoma

Glaucoma should be suspected when:

1. A patient has blurred or "smoky" vision.
2. Close work bothers despite frequent changes in glasses.
3. There are halos or rainbows around lights.
4. There is eye pain after movies, dim lights, or emotion.
5. There is a family history of glaucoma.

Points to Check

1. Vision—use the Snellen chart at 20 feet.
2. Pupils—usually dilated and react slowly in glaucoma.
3. Optic nerve—it is "cupped" and pale in established glaucoma.
4. Tension—measured with Schiotz tonometer. Do not rely on finger test.
5. Visual fields—use test bead and do not rely on confrontation test.

Importance of Referral

Proven and suspected cases of glaucoma should be referred to an ophthalmologist for confirmation of diagnosis and treatment. After intraocular tension is brought under control the patient

must be followed throughout life to be sure that control is maintained.

Concepts of Primary Glaucoma

Aqueous humor is considered to be formed by a combination of secretion and diffusion through the blood aqueous barrier. It is formed primarily in the region of the ciliary epithelium and flows forward into the anterior chamber, and escapes from the eye at the filtration angle into Schlemm's canal and then into aqueous veins and venous channels. The aqueous is in a steady state of motion or flow. Interference with the formation of aqueous, its circulation through the eye or its exit from the eye will result in an alteration in the intraocular tension.

Practically all theories of the etiology and mechanism of primary glaucoma are concerned with a disturbance in the exit of aqueous from the eye. There are two outstanding schools of thought among these theories, the neurovascular and the mechanical, and each school has numerous and prominent supporters.

It is the neurovascular school of thought on which the old classification of primary glaucoma was based. This is the classification on which most of us were brought up, namely:

1. Acute congestive glaucoma (or acute uncompensated).
2. Chronic congestive glaucoma (or chronic uncompensated).
3. Chronic simple glaucoma (or compensated).

The leading proponent of the neurovascular school is Sir Stewart Duke-Elder, who feels that the primary disturbance in congestive glaucoma is a capillary stasis in the ciliary region with increased permeability and edema and a secondary narrowing of the filtration angle of the anterior chamber with a rise in tension. The primary disturbance is thought to be a vascular imbalance, probably neurovascular. Many believe that disturbances in the parasympathetic nervous system, the sympathetic nervous system and the central nervous system may be factors in glaucoma. Others believe in hormonal factors.

The mechanical theory of the origin of primary glaucoma had its inception in 1923 when Raeder suggested a classification of glaucoma based on the depth of the anterior chamber. Barkan presented a classification of glaucoma in 1938 based on the state of the angle of the anterior chamber as observed with gonioscopic lens. With advance in gonioscopic technique it has become more apparent that cases of primary glaucoma fall into two separable groups, those with narrow anterior chamber angles and those with anterior chamber angles of normal depth. Supporters of the mechanical theory of primary glaucoma feel that the iris root blocks the filtration angle before the elevation of intraocular tension occurs and brings about the subsequent elevation of tension. The narrow angle state of these eyes is thought to be the primary predisposing factor. With attacks of increased pressure, and filtration angle closure, peripheral anterior synechia form and the filtration angle blockage gradually becomes permanent. The accumulated evidence of many investigators through anatomic and gonioscopic studies in support of the mechanical theory led the symposium panel on primary glaucoma at the 1948 meeting of the American Academy of Ophthalmology and Otolaryngology, in which Vail, Friedenwald, Kronfeld, Scheie, Dunnington, and Chandler participated, to adopt unanimously the classification of primary glaucoma into narrow angle and wide angle types, as proposed by Raeder in 1923.

Methods of Examination

Methods of examination include: tonometry, perimetry, ophthalmoscopy, gonioscopy, and tonography.

Treatment

Medical Treatment:—(1) Pilocarpine, (2) Eserine (physostigmine), (3) Carcholine (carbaminoylcholine), (4) DFP (diisopropyl fluorophosphate), and (5) Diamox (acetazoleamide).

Surgical Treatment:—(1) Iridectomy, (2) Corneoscleral trephine, (3) Iridencleisis, (4) Goniotomy, and (5) Cyclodiathermy.

General Considerations

The importance of early diagnosis of glaucoma is recognized by all, because effective treatment depends almost entirely upon the early recognition of the condition. Each year as medical science stretches man's life span, glaucoma becomes a more serious problem because it usually strikes the older age groups and is thus finding more victims. The early symptoms of chronic glau-

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Pulmonary Page

NEW PROBLEMS IN THE TUBERCULOSIS FIELD

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As the "new" drugs and excision therapy have shortened the time needed to arrest tuberculosis, a few voices have been raised to warn the medical profession against trusting the drugs too far. Always a treacherous disease, tuberculosis is slow in making a person ill and slow in permitting a cure.

Most of the effect of the three or four more acceptable antituberculous drugs is bacteriostatic. While the drugs keep the tubercle bacilli from growing, the body must be given time to complete the healing processes.

With this bacteriostatic effect on the bacillus has come a peculiar side effect of tranquilization on the public health conscience. Patients with active, infectious tuberculosis have been allowed to receive the drugs at home. They promise to stay away from the public, forgetting that the family, hired-help, doctor's office, and grocery store are part of the public. Patients with active tuberculosis are occasionally permitted to continue working "because they turn negative in a few weeks." Some of these are known to be working with children.

Fortunately, many become bacteriologically negative in a few weeks. Some remain positive and others are not checked adequately. One or two negative smears are not enough to ascertain whether a patient's sputum is really negative. Studies conducted in New York, Chicago and the Scandinavian countries reveal that the sputum of only 50 per cent of their patients treated at home became bacteriologically negative, whereas the sputum of 75 to 85 per cent became negative when home care was preceded by adequate sanatorium care.

There has always been a tendency to terminate treatment of tuberculosis too soon and to neglect adequate follow-up. The patient feels well; the x-ray has shown no change for a few months; some cultures have been negative. If antibiotics also have been given, it is easy to believe, hopefully, that the patient will be all right. But some of these patients have had a relapse of their disease, and need to be followed closely for early signs of recurrence.

Patients must take enough of the drugs to be effectual without causing harm. Two or three must be given concomitantly to prevent development of resistance until the body has gained control of the disease. They must be given long enough to ensure an arrested case.

Patients tire of "swallowing so many pills" or forget to take them. Because of unpleasant side effects, they may persuade their doctors to discontinue one or more of the drugs. Sometimes there are dangerous allergic effects which demand stopping the drugs. On the other hand, the patient usually needs to be encouraged to put up with some unpleasantness and to finish his course of therapy. Such encouragement is best provided in the sanatorium, especially during the early months.

Poorly defined apical lesions need further study by planigrams. An unchanging x-ray does not mean the patient is not giving off tubercle bacilli. Small nodules and lesions roentgenographically stationary can produce positive gastric cultures. Contact with patients having only intermittently positive cultures of gastric washings has been known to infect children who later develop positive tuberculin tests. Repeated x-ray examination only on patients with suspicious shadows, or as a check-up for ex-patients, is not an adequate follow-up without repeated series of gastric cultures to determine whether the disease is transmissible.

Many patients classified as having inactive disease, because the x-ray lesion appears stable or fibrotic, have neglected further observation and

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From the Minnesota State Sanatorium, Ah-gwah-ching, Minnesota.

Clinical Notes

CARE OF THE TERMINAL CANCER PATIENT

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THE GENERAL and specific care of the terminal cancer patient as a rule is not given thorough consideration, for most physicians have to deal with the problem very infrequently. The skill of the physician is taxed to its limit in treating such cases. To be able to carry the patient along, keep him reasonably comfortable and content throughout his period of deterioration until death, is an accomplishment attained by relatively few physicians.

The relationship and understanding obtained between the physician and the patient is the basis upon which all treatment is built. The keystone in this is *truth!* It is impossible to carry the cancer patient through the trials and tribulations of his disease without his having knowledge and some understanding of the nature of the disease. As progression occurs and new symptoms develop the patient wants to know what is causing these symptoms. If the nature of the disease is hidden from the patient, he is told "white lies." Soon these become confused as the doctor or the family forgets what the deceit is supposed to be. Slips occur, looks are furtive, not forthright, and the patient becomes suspicious. Soon he will trust neither his family nor his doctor. He is then completely alone trying to keep the family and the doctor from realizing that he knows the truth. A typical example is that of a woman who had cancer of the breast and whose physician did not tell her the nature of the disease. Later she stated that she knew it was cancer, but didn't want to tell the doctor because he was so nice and she didn't want to make him feel bad.

Illness creates aloneness in the patient, but this aloneness is immensely greater in the patient with cancer than in other types of patient. The physician is the sole person who can dispel this aloneness. An honest association built by truthful statements creates an interpersonal relationship which is as great as any we find in this world. Each feels free to discuss this disease and its attendant problems and the patient is relieved of the consuming loneliness of the world.

It is an interesting fact that many patients, despite knowing very well the nature of their disease, will more and more be inclined not to mention it. Some few even convince themselves that they do not have cancer.

One may find fault with this attitude of frankness and honesty between patient and physician regarding cancer, saying that the patient loses all hope and retreats into a mental collapse upon hearing he has cancer. Certainly it will be true that perhaps one patient in ten thousand will commit suicide when possessed of the knowledge. The rest of the patients will be thrown into a profound depression, but soon, and not without the physician's help, they will rally their forces and assume a spirit of co-operation that is remarkable to behold.

In discussions of his disease one need not belabor the patient with details. Questions can be answered as they arise. The patient would prefer it this way. He wants to be able to find for himself a small glimmer of hope somewhere. You need not deprive him of it unless questioned point blank. Subsequently in discussing his cancer it is better to use synonyms, such as tumor, sarcoma, carcinoma, et cetera, rather than the word cancer, for the other less well known words have less of an impact upon the sensitive feelings of the patient.

Needless to say, the cancer patient, in his terminal state, is hypersensitive to his environment. Loud noises bother him, confusion is irritating, smells are accentuated and meanings of words are easily twisted. It is trying to the physician to have to be constantly on guard to prevent irritations, but this is part of the total treatment.

Presented at the annual staff meeting of St. Joseph's Hospital, Saint Paul, Minnesota, January 17, 1956.

Hard as it may be to see the patient when no word of cheer or statement of improvement can be given, you must not skip seeing these patients regularly on rounds. The physician's visit is the most important part of the day for the patient. Don't deprive him of it!

The hospital care of the terminal cancer patient is generally easier to conduct than home care. One great drawback in hospital care is food. Special attention must be paid to what the patient can eat and to how it is presented. He must be encouraged to eat what he can and this must be made palatable and attractive. Considerable burden is placed on the dietitian and the hospital kitchen to try to make the food attractive and edible.

Control of pain is a variable factor. It may be simple or very difficult. Pain, particularly from bony involvement, may be excessive before it is possible to demonstrate changes on x-ray. Often such large doses of narcotics are necessary that the patient becomes addicted to the drug and is apt to display the unpleasant side-effects of addiction such as querulousness, irritability, lying and paranoia.

Chlorpromazine is useful in controlling the nausea which so frequently accompanies carcinomatosis. It must be remembered that chlorpromazine may potentiate the effect of the narcotics; in fact, this action may be so marked that care must be used in regulating the dosage of the narcotic for profound depression of physiologic function may result even to the point of cessation of respiration if doses of narotics are too large.

Cobra venom may exert a beneficial effect in potentiating narcotics. Recently we had a patient with carcinomatosis from breast carcinoma who made the statement that with the cobra venom life was bearable, but without it the pain was severe in spite of continued use of the same dose of narcotic.

Nerve block by injection with alcohol or nerve section often relieves pain in a localized area but more often one must resort to cordotomy (more properly—spinothalamic trachtotomy) to afford relief of widespread pain. This operation is not without some unpleasant side-effects, but is a boon to the individual who is expected to live some period of time with persistent severe pain. Finally, prefrontal lobotomy may be resorted to. It is interesting that this operation does not relieve the pain, but it does away with the affective component of the pain. The patient, after lobotomy, when questioned says "Yes, I have the pain but what of it?" Personality changes of varying degree attend this operation, so that it is advisable to rely on other pain relieving measures as long as possible.

The beneficial effects of x-ray therapy in relieving pain are well known and even though a cure may not be effected with such treatment the palliation may be great. Cobalt therapy has the same effects as x-ray therapy, but may allow a greater dose of radiation to be delivered to the tumor without damage to the skin because of the selective emission of rays. Radioactive gold has had some success in terminating or decreasing the accumulation of fluid in serous cavities; however, in general, the same or better results can be obtained by the use of external radiation. Nitrogen mustards in the treatment of pleural fluid collections fall into the same category as radioactive gold. Ordinarily if radiation is not effective neither is the nitrogen mustard treatment. Of course, we must not forget the simple palliative measures such as paracentesis and thoracentesis merely to make the patient more comfortable.

Refrigeration was studied quite thoroughly about fifteen to twenty years ago by Temple Fay, who found that the cancer was held in abeyance by the refrigeration process but that once the individual was warmed to normal levels the tumor began to again to grow. At present, Dr. F. John Lewis is reopening this investigation to determine whether or not a more uniform refrigeration, as obtained by new hypothermia machines, will be more beneficial than the older methods.

Care outside of the hospital may be undertaken in a cancer home or in the individual's own home. Certainly if the family can possibly care for the patient in the home, it is a great kindness to the patient to allow him to be with friends to the end. This is often not possible and a cancer home must be resorted to. How does one explain to a patient that he is being sent to a cancer home if one has not been completely honest about the nature of the disease? It is simple—you can't!

A considerable burden is placed upon the family to take the care of the terminal cancer in the home. It is a task of unending attention, but has its rewards in the happiness of the patient. A rented hospital bed is one of the first requirements for facilitating the nursing prob-

lems and making the patient a great deal more comfortable than he otherwise would be. Dressings often must be obtained in quantity. These will be furnished and delivered by the local chapter of the American Cancer Society. Assistance in nursing problems can be had from the Family Nursing Service or American Cancer Society. Should the patient have to be taken to the hospital for x-ray treatments or other treatments, transportation will be furnished by the American Cancer Society.

Control of pain, at home, is similar to that in the hospital save that the family must be taught to give hypos. Your office nurse or the nurses at the hospital will teach the family how to handle the hypodermic injection problems. Liquid medications such as Demerol, Dolophine, Levodromaran, et cetera, are better than pills for they are easier to handle. One dose ampules, with color breaks, help to avoid the problem of contamination. Ampins of morphine, though expensive, are useful when morphine is needed.

Those responsible for the patient should be taught how to care for the skin and how to avoid trauma to pressure points in order to prevent the development of decubitus ulcers. Careful use of pillows, frequent turning of the patient, cleanliness of the back and gentle massage of the skin will pay dividends in the long term care for after decubitus ulcers once develop the care and treatment becomes a sore trial. Artifices and skills are put to a test in preparing food for the cancer patient who has no appetite. This is particularly true of the person who is receiving x-ray therapy. A useful ruse in getting protein into the anorexic patient is to dissolve gelatin in coffee—but don't let the coffee get cold for if it does the liquid will jell.

Above all try to keep the patient occupied! Constructive activity helps to pass the hours away and keeps the mind off of the symptoms of the disease. By and large the total care of the cancer patient resolves itself into kindness, honesty, thoughtfulness and gentleness.

Walt Whitman has said, "The faithful hand of the living does not desert the hand of the dying."

GLAUCOMA AND THE FAMILY DOCTOR

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coma are extremely vague. The general practitioner is in a good position to help in the control of blindness due to glaucoma because he sees these patients earlier and more frequently than the ophthalmologist. He should be suspicious of glaucoma in patients with rapidly increasing presbyopia, fleeting obscuration of vision, occasional presence of halos, a family history of glaucoma, eye discomfort after a stay in the dark (as in a movie), poor dark adaptation, et cetera. It has been recommended by Zeller and Christensen, and I agree with them, that tonometry be made a routine part of every physical examination. There are 20,000 persons in this country who are totally blind from glaucoma (12 per cent of the adult blind population) and there are another 150,000 who are blind in one eye from glaucoma. Although exceptions do occur, without treatment the disease is progressive and results in absolute blindness. In the average case the end result depends essentially on two factors, the stage at which the patient comes under treatment, and the sustained adequacy of the treatment. It is impossible to give an accurate prognosis on primary glaucoma, but under adequate treatment in about 70 per cent of the cases the disease would probably be adequately controlled and stabilized, 20 per cent of the patients would slowly deteriorate but retain sight until death, while 10 per cent would do badly and become blind.

Current Concepts

PHYSICAL SIGNS OF FUNCTIONAL HEART DISEASE

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Tachycardia from nervous causes can sometimes simulate such a condition as paroxysmal tachycardia. In functional tachycardia the cardiac mechanism remains normal, and the rate although high varies measurably with such things as posture, exercise, and rest. In paroxysmal tachycardia the rate remains practically constant in the individual case whether the patient is resting or not.

The normal heart sounds vary to some extent. The first sound for example in nervous young adults may be louder and more abrupt than normal, and its quality may be impure. These changes may even lead to the suspicion that there is early mitral stenosis. Such an organic lesion may be without demonstrable changes radiologically or in the cardiogram. The exaggerated first sound of the normal excitable heart has to a musical ear a low pitch, that of early mitral stenosis a high one. The differential diagnosis in such cases may be further confused by the presence of a physiologic third heart sound. This is a distinct isolated and clearly limited distant little thud and heard at the apex. It is usually more audible towards the end of expiration, and particularly when the patient is in the left lateral position. This postural accentuation is of course characteristic also of the diastolic and presystolic murmurs of mitral stenosis. The third heart sound is much briefer than the diastolic mitral murmur.

The experienced physician learns to distinguish a number of murmurs to which the label functional is best applied. The commonest of these is a systolic murmur audible at the apex and conducted not into the axilla but towards the left sternal border, and thence up to the pulmonary base. A second example is a systolic murmur restricted to the pulmonary conus area. A third example is a soft blowing systolic sound best audible at the apex and conducted into the axilla. At first hearing this murmur might seem to be difficult to distinguish from that of mitral insufficiency. It is however entirely limited to inspiration and is not produced inside the heart cavity at all. A further example, which is unique among functional murmurs in being present in diastole, is a rather short diastolic shuffling sound, sometimes quite distant and suggesting the diastolic murmur of aortic incompetence. This murmur is heard at the pulmonary base, sometimes also the aortic base. It is not conducted downwards as far as the true murmur of aortic regurgitation, and it may be made to disappear completely during full inspiration. It also is no doubt exocardial in origin. All of these murmurs exist without symptoms, and any other demonstrable abnormality in the heart or cardiovascular system, clinically, electrocardiographically, or radiologically.

The physical explanation as to the cause of these functional murmurs is as yet unknown. Their obvious innocence in the eyes of cardiologists of experience will no doubt give them immunity from investigation for a further period of time.

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This is the second in a series of four articles by the author on this subject.

HOUSING DECAY

A review of housing conditions in any one of our major cities discloses the communicability of housing decay. Like measles among a susceptible population, it spreads persistently from block to block, from area to area, infecting all who have not previously succumbed. Epidemiologically, there is first the contagion of housing endodecay which encourages the use of damp, unlighted, and unventilated rooms and results in room overcrowding and insanitary practices. Second, there is the contagion of housing exodecay which begins with neighborhoods and blighted areas creating shabby properties with decreasing values to be shunned like an exotic plague. HENRY F. VAUGHN, Dr. P. H., *Am. J. Pub. Health,* March, 1956.

Editorials

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ELECTROKYMOGRAPHY

Tracing Cardiovascular Pulsations on the Fluoroscope

Electrokymography was developed in the postwar years as a new method for investigating the pulsations of the atria, ventricles, and large vessels. It represents a canny combination of the x-ray and the electrocardiograph, the galvanometer of the latter being used for recording the pulsations of the various structures as revealed on a special, small fluoroscopic screen.

Excessive hopes of early workers led to disappointment when it was proven that exact physiologic determinations are beyond the possibilities of the method. Both changes of volume and intrinsic motions of the various structures, density changes, and border motions affect the tracing. The heart sometimes flops within the chest at each cycle and a sick, enlarged heart has greater shifts and does more flopping than a normal one.

In spite of these limitations, which are inherent in the physiologic setup to be studied, extremely interesting data have been gathered. The most significant are those obtained in rheumatic heart disease (where the dynamics of the left atrial chamber are deeply changed by lesions of the mitral valve) and in coronary heart disease (where the scarred ventricular wall may behave in an entirely different fashion from the normal wall). Some promising data have been gathered in cases with aortic or pulmonic stenosis, coarctation of the aorta, cor pulmonale, aortic aneurysms, and constrictive pericarditis.

The method is still in its infancy and may become a useful addition to x-ray and fluoroscopy of the heart. It is less used than it deserves because the results obtained by unskilled workers, often using poor technique, has cast some discredit on the method. It should be kept in mind that interpretation of an electrokymogram requires a moderate physiologic knowledge of the various motions of the heart and vessels and a certain training in roentgenology.

Technique.—Certain technical rules should be followed in order to obtain clinically adequate tracings. The following apparatus are needed:

1. A carefully checked x-ray apparatus (best if full-wave rectification is used).
2. A good pick-up including a rapid fluoroscopic screen.
3. An electric filter.
4. A recording galvanometer with possibility of recording films at 75 mm/sec.
5. A simultaneous tracing for timing (carotid pulse or phonocardiogram). The patient should be lying down (children) or sitting (adults), and the tracing should be taken in apnea.

Several positions of the pick-up and the patient can be used. The operator should become familiar with all of them, so that he may select those which are the best suitable for the study of the particular cardiovascular structure which is involved. Indication should be given on whether the tracing is a border tracing or a densogram.

With the above precautions and a moderate training, information of importance can be gathered and the correlation of this with clinical, phonocardiographic, electrocardiographic, and roentgenologic data gives a complete evaluation of the cardiac condition.

A. A. LUISADA, M.D.

SERODIAGNOSIS OF CANCER

On page 571 of this issue of MINNESOTA MEDICINE begins an article concerning the present status of "the seroflocculation reaction." The author, Dr. Penn, states that this reaction "may prove to be an object of research of interesting and important heuristic value. . . ." For those of us, such as myself, who may not be familiar with the last-mentioned adjective, "heuristic" is a term that can be applied to arguments and methods of demonstration that are persuasive rather than logically compelling; such methods are designed to lead a person to find out things for himself.

Seroflocculation refers to flocculation produced in blood serum by an antigen. A variety of seroflocculation reactions are possible, the number of which is limited only by the ingenuity of investigators in thinking of antigens to add to serum. A familiar example is the Henry seroflocculation reaction for malaria, in which the

antigens are nonspecific melanotic substances and fine-grained iron. The antigen used in the particular seroflocculation test under consideration originally was derived from the livers of persons who died of cancer. Naturally, then, interest centers around this reaction as a possible diagnostic test for malignant tumors.

The development of a simple test for the detection of cancer that would be applicable as a practical and accurate screening diagnostic procedure has occupied the interest of many investigators for many years. Thus far, the attainment of such a technique appears to be comparable to the caging of a will-o'-the-wisp. The requirements of a good test for cancer are stringent. The technique should be simple and easily reproducible. It should be of high specificity so that positive results will be found only in association with malignant tumors. False negative reactions should not occur. Positive and negative reactions should be sharply demarcated, with a minimal zone of doubtful reactions. A paragon such as this might appear to be a Utopian dream; however, many current routine immunologic and chemical tests approach this degree of specificity, accuracy and reliability. It is regrettable that no test for the detection of cancer available at present can remotely qualify for these requirements.

Analyzing a series of 763 cases, Dr. Penn's group found that a recent version of their seroflocculation test gave more than 90 per cent correct diagnoses of histologically proved malignant tumors. This percentage was based on 185 cases of verified cancer of various stages and categories. Dr. Penn does not mention the incidence of false positive reactions in the present article. Other reports of his group have stated that this series of 763 cases included 262 instances of noncancerous disease; positive reactions were obtained by the routine 2-tube qualitative technique in 37 per cent of these patients who did not have cancer, and positive reactions were obtained in 16 per cent by the technique of quantitative dilution of serum. The 763 cases also included 316 "normal" persons; the incidence of positive results among these was 9 per cent. Therefore, Dr. Penn wisely and correctly has emphasized that this particular seroflocculation test in its present state of development is not a specific diagnostic procedure for cancer.

Let us assume that a test for cancer gives 90 per cent correct results and 10 per cent false positive reactions. These figures for both sensitivity and specificity are better than those provided by most "tests for cancer" now available. Let us apply such a hypothetic test as a screening procedure to 1,000,000 "normal" people. Let us assume arbitrarily that one in 500 of this group has an unsuspected cancer. The test, then, will detect 1,800 of the 2,000 cancers present in such a group. At the same time, however, false positive reactions will be reported for 99,800 persons who do not have cancer. It is obvious that great expense will be entailed for subsequent diagnostic work to rule out the presence of cancer in these persons, to say nothing of the mental anguish imposed on healthy persons by such faulty results.

Because a reliable test for cancer is not available at present, the early detection of malignant tumors still depends on education of the public and constant vigilance on the part of the physician. The only satisfactory current method for the identification of cancer is the use of biopsy and of cytologic examination of smears.

GEORGE G. STILWELL, M.D.

VALUE OF A SAVINGS ACCOUNT

The value of saving money is synonymous with the reasons why people save. The principles of why people save have been inherited from the past and vary only slightly with the standard of living of any period. Thus, the basic reasons for saving today are the same as they have been throughout history. These inherent reasons are old because saving is as old as history. We know, for instance, that saving was common in Babylon nearly forty centuries ago, or two thousand years before Christ. Savings accounts can be traced to the old temples of Greece and to the fourth century of the Great Roman Empire. Saving reached a high level of activity in the early part of the sixteenth century in Venice. Saving lost ground in England about 1640, when Charles I raided the Exchequer to such an extent that people, their confidence shaken in government depositories, turned to goldsmiths for protection of their valuables. We in Minnesota have a fine record of saving inherited from European countries. Our early pioneers brought with them this habit which has been handed down from generation to generation.

Throughout the years several studies have been made to determine the answer to the question,

"Why do people save?" Not long ago the department of economics at Harvard University published a study by Professor Dusenberry, in which he points out that there is a constant conflict between a person's desire to improve his current standard of living and his desire for future welfare by savings. On one side, there is the demand upon our budget for the many things we could have to improve our standard of living. On the other side of the conflict is our concern for our future welfare, which can be divided into two headings: (1) Saving for the events we hope will *not* happen; and (2) saving for the events we hope *will* happen.

The Saving Research Center of the University of Michigan delved deeply into the subject a few years ago. Their survey clearly shows that emergencies and sickness head the list of reasons most people give for saving. The purchase of automobiles and other durable goods ranks second, and general living expenses third. After that came repairs to the house, travel, education, moving and buying a home, in about that order.

Certainly one must agree that the reasons for saving are of extreme importance. This being true, the "Value of a Savings Account" is obvious. Saving is the method or the key to our future welfare.

ELMER D. DUFVA, *Assistant Cashier*
The First National Bank of Saint Paul

PHOTOENGRAVING

Photoengravings, for our purpose in this discussion, will be treated as two distinct operations—line engraving as distinguished from halftone engraving.

To begin with, in making a line engraving on zinc or copper for use in letterpress printing, we start with a line drawing either in pen and ink or crayon. The crayon, however, must be black or nearly black in tone, otherwise the camera will not pick it up in sufficient strength or density to hold when printed on metal and etched.

The drawing or photograph is placed on the copy board in front of the camera, which is on a movable base, which can be moved forward or backward depending on the size of the enlargement or reduction. There are five basic steps involved in making an engraving.

The camera works just like any roll film camera that one might use for taking snapshots, with some exceptions:

1. The film we use is very slow, and exposures range from ten seconds for line negatives to three minutes for halftone negatives. In taking a snapshot the exposure runs from 1/25 to 1/100 of a second.

2. Our film comes in rolls, like the ordinary kodak film, only the rolls are 9½, 13, 19, 30, and 43 inches wide and 100 feet long.

3. We roll the film out on the camera to the desired length, using the proper width film and cut it off by pulling a knife which is contained in the film box, so we can develop one negative at a time.

4. When making a halftone from a photograph, a screen is used in front of the film and back of the lens, in a holder provided for this purpose. The screen breaks up the continuous tone photograph such as a portrait, into a series of dots, necessary for printing with ink on paper. The fineness of the screen to be used depends on the stock or paper on which the halftone is to be printed. The rougher the surface of the paper, the coarser the screen that must be used. In printing an etching, this is not important because we are printing solids. For guidance in selecting the screen for a particular stock, we suggest 60 line for general newspaper work, 100 line for magazine, 120 line for No. 2 enamel, 133* for high grade enamel, and 150 on the best enamel paper.

5. When the negatives have been made and developed, they are assembled on a sheet of glass. This is done for two reasons:

(a) In the interest of economy, negatives can be grouped with others so they can be handled through the printing and etching steps as one unit. If they were handled singly through the various steps, the cost would be prohibitive.

(b) Assembly of complicated layouts, where we are combining line negatives with halftone negatives, becomes possible by stripping or fitting these units together on one piece of glass. The film comes on an acetate backing, is very thin and is readily stripped off this backing when it has been thoroughly moistened.

Now we have the image in filmform on glass either in line or halftone. This then is printed on metal, similar to printing on paper with the ordi-

This is the second in a series of editorials by the author on this subject.

*For MINNESOTA MEDICINE, halftone cuts are made with 133 line screen.

nary snapshot negative in a photo studio. Clean metal, either zinc or copper, is coated with a light sensitive enamel which becomes an acid resister after developing and drying.

The negative is placed face down on the metal and brought in overall contact by vacuum in a vacuum frame and then exposed for five minutes under arc lights. It is then developed and dried. One type of enamel is developed with water, the other with alcohol. Halftone prints on copper are dried and baked to a dark color so the image can be seen. Zinc is dried and is ready for etching without heating, since the developer contains a dye that brings out the image.

Areas exposed to the light during printing become set or fixed and do not develop off the plate. Unexposed areas do not stay on the plate in the developing process and so leave exposed bare metal. These bare metal areas will be etched into or partially etched away to the required depth for printing on paper.

Etching, finishing and the further steps of making an engraving will be discussed briefly in the next issue.

W. W. CHREIMAN
Manager, Graphic Arts Division
Buckbee Mears Company

COLOR TV—THE BIG QUANDARY

The fall and winter of 1955-56 were touted as the time for "The Big Push In Color Television." Aware of the new emphasis on color in automobiles, in home furnishings, and in clothing, the men who translate today's experiment into tomorrow's standard were convinced color TV would come into its own.

So far, it hasn't. Programs in color have increased something like 500 per cent. Big screen color receivers are available for sale. But color TV has been slow to "catch fire."

Part of the reason why is the dilemma facing this new development. Up until now, the public has not bought color receivers in quantity, because there were not enough programs in color. There have not been many programs in color because there were not enough color sets out to justify the extra trouble and cost of color program production. There has been no appreciable decline in set prices—which range from $500 on up.

There are something like 10,000 color sets in the United States, compared to 37 million black and white receivers. In the Twin Cities, there are an estimated 400 color sets—and 609,000 black and white receivers. It's obvious the telecasters must give first thought to their larger audience which watches black and white TV. There have been some complaints that programs originating in color produce a "soft" picture on black and white sets—a picture less crisp and distinct than the familiar black and white originations.

In any event, if color television is to boom, something has to give. There's no doubt color adds a great deal of life and depth to the television picture. The industry is producing more and more programs in color—working to create viewer enthusiasm, increase orders for color sets, and permit mass production to get rolling—with its resultant decrease in unit price for sets.

WCCO-TV is equipped to originate "live" color programs from its studios, and has presented a dozen or so of them. KSTP-TV has installed equipment to telecast slides and film in color. Both stations have been transmitting CBS and NBC color telecasts in full color for more than a year.

All in all, several million dollars are riding on a wager that once you have seen television in glowing natural color, you'll want a color receiver in your own home. But, like everything else in the television industry, it boils down in simplest terms to public demand. It's up to you.

GENE GODT
WCCO Radio and TV

THE HISTORY OF GLASS CONTAINERS

Though mechanical processes had long been in operation in other forms of glassmaking, no one had yet devised a way of shaping the neck and shoulders of a bottle automatically. Then, while various mechanical improvements had been introduced by 1900, no machine was entirely automatic. In 1903, the first fully automatic bottle machine was invented, and the glass container industry progressed further than it had at any time since the invention of the blowpipe some two thousand years earlier.

Overnight, metal arms revolving in endless succession around a vertical axis replaced the arms of glass blowers. Overnight, compressed air replaced lung power. Most important, this mechanical marvel soon delivered an endless succession of bottles to annealing ovens at the incredible rate of a mil-

This is the fifth in a series of editorials on this subject.

lion a week! Called the father of mechanized glass, Michael J. Owens was the inventor of the first entirely automatic bottle-making machine. Though similar machines were to be patented later by others, Mr. Owens is credited with revolutionizing the glass container industry.

Mechanization wrought many changes in the glass container industry during the next half century. Original machines were, of course, perfected considerably through the decades. Research, on which millions of dollars were spent, lead to improved production techniques and an improved product. Machine-made bottles, being uniform, made high-speed automatic capping and sealing machines possible. New plants sprang up. The result: An increasing number of glass containers bearing foods, beverages, drug and cosmetics and chemicals found their way into American homes.

The efficiency of the glass package also depends upon its closure, glass containers, of course, being incomplete without a cap, and the closure industry has kept full pace with the remarkable progress of the glass container industry in the last half century. Cork stoppers, screw caps, lug caps, crown pry-off, friction-type closures and others, each with special advantages, are all applied today by high speed machines in a single operation, making possible the wide range of products now available in glass to American consumers.

In some ninety glass container plants located throughout the United States today, automatic machines, each consisting of some 10,000 parts, are producing glass containers at speeds as high as 250 a minute. Annual production in the United States is now in the neighborhood of 18 billion glass containers—or 112 for every man, woman and child in the country. Not only are these automatic bottle-making machines producing more glass containers, but they are producing better and stronger bottles than ever before.

JOHN M. FOSTER
Foster-Forbes Glass Company

REHABILITATION IN PULMONARY TUBERCULOSIS

While Varrier Jones proceeded with his practical application of the idea of Hermann Biggs, other thinkers concentrated on variations of the theory of rest, in their belief that these alone would fit the patient for immediate return to his former conditions of home and work. Marcus Paterson introduced graduated exercise at the Brompton Hospital Sanatorium, on the theory that auto-inoculation, produced by controlled walking exercise, gardening and games, would build up resistance against further breakdown. This made little difference in the mortality rates, which continued at some sixty per cent within some five years of discharge, for fully sixty per cent of those admitted with more than early disease. Others, who had not accepted the findings of Midhurst Sanatorium that a negative sputum merely postponed the date of breakdown and death for some two years beyond that of the positive case, pressed for continuance of sanatorium residence until sputum conversion.

Many pinned their faith on the addition of local to general rest. At the end of last century Kingston Fowler had stated his postmortem findings on the arrested state of the disease in cases found to have had a spontaneous pneumothorax at some time during life. He suggested artificial pneumothorax, which was introduced by Forlanini, and developed by such pioneers as Rivière, Lillingston, Pearson and Burrell. Similarly, during World War I, Gravesen of Denmark developed the thoracoplasty introduced by Sauerbruck of Germany. Artificial pneumothorax, like its allied pneumoperitoneum, is now out of fashion, although its physical results where refills remain in the hands of a single operator are often excellent. Thoracoplasty continues, albeit on a minor scale since surgeons have concentrated on excision, from segmental resection to pneumonectomy. Its results have not been those expected; by and large where it has been used as a single method of arresting disease it has had little better effect than extended sanatorium or medical collapse therapy, although many individual successes in long after-histories can be quoted.

Just before World War II, Wingfield and Macpherson of Brompton Hospital Sanatorium stressed the necessity for x-ray examination of supposedly healthy adolescents and young adults, if we were to find disease in an early stage before its insidious onset and development had deprived the patient of the possible benefits of collapse-therapy. After-histories were already proving that results in the average case with stage II or stage III of the disease were little better in 1935 than they had been in 1915. Mass x-ray examinations, developed from the work of de Abreau, were

This is the fourth in a series of editorials by the author on this subject.

quickly introduced at recruiting centers for the Armed Services, and did much good work in the discovery of unsuspected, symptomless disease. They have since been extended to civilian populations and to hospital admissions, after the example set by St. Joseph's Hospital in St. Paul.

At the end of World War II came streptomycin, quickly followed by its variants, and by drugs from P.A.S. to Isoniazid, all of which have now had trials as single agents or in combinations.

What all this means is that the method of treatment towards physical rehabilitation has changed very markedly in the last twenty years. The soil has become less important than the seed. Eradication of the bacillus is now the aim. We are back again to the belief that the whole future of the patient depends on the conversion of his sputum. Unfortunately, in the pursuit of this object the patient is all too often of secondary importance, with results which are deplored, but expected by those who believe that the real object of treatment is the full, physical, psychological, economic and social rehabilitation of the patient as an individual. The true physician must continue to treat his patient with disease, not disease in his patient.

R. R. Trail, M.D.
London, England

TROUBLE IS THEIR BUSINESS

On this very day a prisoner in California is being paroled to a new and better life; an unmarried mother in Pennsylvania is seeing her newborn child for the first time, confident of his future and hers; an alcoholic from Chicago's Gold Coast is being helped in his recovery from delirium tremens; a forty-six-year-old mountain resident in North Carolina is learning the alphabet; a thirteen-year-old girl in Indiana has received word that she is going to summer camp.

All of these things, and countless others, are possible because of the work of an international army whose pride is that no one fires a gun or knows how to thrust a bayonet. This is an army composed of hundreds of thousands of active soldiers led by an international corps of over 32,000 officers and cadets who battle in eighty-five countries throughout the world.

They speak in 102 languages and dialects, work outdoors or inside, in rain, snow or sleet. They pop up in the strangest places—after a Japanese earthquake, a New England flood, an Indian famine or a Mexican epidemic—anywhere disaster has struck and help is needed. Within several hours of a hurricane, flood or fire, a patrol of soldiers, headed by an officer and equipped with the latest in mobile canteen and service trucks, will appear on the scene and quietly set to work.

The stumbling bum of the slums, the distraught unmarried mother, the lost derelict, the prisoner and the paroled, the dope victim, the wounded and dying of the city's streets are the people who know this army well. But the ordinary citizen also recognizes them: A cheerful uniformly-dressed band of dedicated men and women who work, sing and preach in countless cities throughout the world—The Salvation Army.

These are a trouble-hunting bunch of people who go out of their way to look for it. Trouble is their business and they have organized to fight against it in a highly efficient manner.

Are you unemployed? Hungry? Friendless and lost? Hurt and disabled? Need spiritual comfort and help? The Salvation Army not only steps in, it seeks you out, finds you, and helps you find yourself—giving you every aid in its repertoire of helpfulness.

Twenty-four hours after the recent California floods brought havoc to helpless thousands, members of The Salvation Army were on the scene. Quietly, efficiently, trained soldiers worked to ease the destruction and pain. Knee deep in the muddy levee banks of swollen rivers, a worker wielding a shovel would suddenly straighten up and grin as he accepted a cup of hot coffee and one of the famous Salvation Army doughnuts. Hundreds of people were given first aid and warm clothing in newly set up mobile aid centers.

The sensational, headline-screaming catastrophe, however, represents only a small part of this Army's activity. It is the day-to-day work, carried on quietly and without fuss, that is basic. The singing and preaching on street corners is merely one method of calling people's attention to God and to the services The Army renders.

Just how busy The Salvation Army has been in the past year is revealed in some simple figures: Over 33 million meals provided free, 14 million in the United States alone; 11 million beds given to the homeless wandering. These are aids that bring no headlines.

Not only does it reclaim the degraded and the dissolute, attend to the poor and sick, but it goes all out to bring the gospel of Christ into the paths of the most wayward.

Almost 4 million youngsters attended The Army's 327 youth centers in this country, and 32,000 went to their summer camps. Over 10,000 unmarried mothers were given complete care and attention in the thirty-four Booth Memorial Hospitals and some 2 million patients were visited and comforted in various other hospitals and health centers. The Army runs eighty-eight employment agencies, 126 hotels, 109 social service centers. Its services penetrate every aspect of our society.

William Booth, an English Methodist minister, brought The Salvation Army into being in 1865 with a single purpose—to seek out and help the sinner and people without hope in the streets and sidewalks of the city.

Working in the slums of East London, he discovered his converts were refused admission in the established churches. He banded them together outside the church and in 1878 named his organization "The Salvation Army," setting up a devil-fighting unit along military lines, with uniforms, rank, strict training and discipline. So startling was their attack on evil and so overwhelming their success, that George Bernard Shaw, Britain's great dramatist, said of them: "Here is an army that substitutes the drum for the organ and actually fights the devil instead of merely praying at him!"

In 1880, a group of eight officers from England disembarked at New York's Battery Park and promptly held the first fully-authorized meeting in the United States. From this humble beginning, The Salvation Army in the United States now has nearly one-quarter million members and over 5,000 officers.

Who are these officers?

They are rigidly-trained people who attend a West Point-type training center (there are four in the U.S.: In New York, Chicago, San Francisco and Atlanta) for a year of study and welfare work. After another year of probation and field work they become fully commissioned officers. They advance in rank just as in the regular army, cannot marry or move without permission, and are given a modest salary.

It was in 1941 that The Army co-operated in initiating the idea of an interfaith organization to attend to the nonmilitary needs of servicemen. In short order such an agency, United Service Organizations (USO) went into effect on all fronts. In 1944, The Salvation Army's own Red Shield Clubs and other service clubs throughout the world, numbered 3,000. Over 27 million service personnel were served in these clubs in the U. S. alone.

While the street corner singing, the cup of hot coffee and the doughnut are sure marks of The Salvation Army daily at work, the growth of its ranks is the gauge of their effectiveness in driving the devil out of men's hearts. The Salvation Army is a devoted, hard-working team from which we can all take deep inspiration.

J. S.

WHY CONVENIENCE FOODS?

The increasing trend for the housewife to use convenience foods has been marked. Not only has this come about because of the convenience of prepared foods and dinners, but because there are very few families who at this time have servants or will continue to have servants in the future. A census recently revealed that less than 2 per cent of American households now have servants. Another factor in the development of the convenience foods has been the development of the single family home. This particular development has occurred throughout the entire country and with it has come a more basic interest in the home and in the kitchen and the preparation of the meals. Further, there is an increasing number of meals in which only one or two people partake. This decrease in the number of people partaking of any meal detracts from the incentive of preparing a large meal. As a result more and more people are turning towards convenience foods. In addition, mothers with large families find themselves so engrossed in raising their children that the convenience foods have given to them the time and opportunity to be with their family rather than slaving in the kitchen. Today the average housewife knows that a meal prepared from convenience foods will be as tasty and appetizing as any meal prepared by her mother or grandmother. The preparation of such a convenient meal gives her additional time to devote to her guests and enables her to spend less time in the kitchen.

The art of cooking has not been lost, it has been scientifically developed and conveniently arranged so that today the least experienced cook may prepare a most delicious meal.

J. F. B.

READERSHIP SURVEY

More than 10 per cent of the membership of the Minnesota State Medical Association formed the sample of readers of MINNESOTA MEDICINE interviewed by readership survey experts from the University of Minnesota School of Journalism at the Rochester meeting of the MSMA. This sample is considered representative except insofar as physicians who attend the State meeting and those who consent to be interviewed may form a selected group.

Some of the observations derived from the survey are:

Favorable spontaneous comments outnumbered the unfavorable in a ratio of three to one.

Two out of three subscribers to MINNESOTA MEDICINE think enough of its contents to save or clip issues for future reference.

Departments read from "occasionally" to "regularly" were, in order: Table of Contents, regular articles, editorials, General Interest, Reports and Announcements, Case Presentations, In Memoriam, Medical Economics, Clinical Concepts, Seminars, and President's Letter.

One out of six subscribers feels that MINNESOTA MEDICINE gives too much attention to some subjects.

Subscribers showed a strong preference for articles with immediate clinical application as opposed to more fundamental, scientific articles. They also indicated a desire for more articles of a short review nature.

About half of the subscribers consider MINNESOTA MEDICINE "above average" or "excellent" when judged against other general medical magazines. About one in twenty subscribers rated the magazine as "below average" or "poor."

Subscribers read MINNESOTA MEDICINE more often than they read the *Journal of the American Medical Association.*

The School of Journalism report on the survey had this comment: "Acceptance of the magazine appears to be high. . . ." This was in comparison with the numerous other similar studies the school has conducted in the past.

The detailed study of the survey's results is the continuing function of the Editorial Board. In the meantime, we express our thanks to the 356 physicians who gave us their time and the benefit of their knowledge and wisdom when they were interviewed.

H.G.M.

In Memoriam

NORMAN P. BENTLEY

Dr. Norman P. Bentley, a St. Paul physician for thirty-eight years, died August 6, 1956. He was sixty-eight years old.

A graduate of Syracuse University Medical School, Syracuse, New York, he practiced medicine at Cape Vincent, New York, before moving to St. Paul in 1918. He was a World War I veteran and a member of the American Legion and Masonic Lodge at Belmont, New York, a member of the Izaak Walton League, the St. Anthony Park Association, the Kiwanis Club and a life member of the St. Paul Athletic Club.

Dr. Bentley's memberships also included the Ramsey County Medical Society, the Minnesota State Medical Association, the American Medical Association, and Phi Beta Pi medical fraternity.

Funeral services were held August 9 in St. Paul with burial in Cape Vincent, New York. Surviving Dr. Bentley is his wife, Helena.

WILLIAM H. HOLLAND

Dr. William Howard Holland, a physician at Fisher, Minnesota, since 1909, died in July, 1956. He was seventy-five years old.

Born in Vernon Center township, Fond du Lac County, Wisconsin, he graduated from the Hamline University Medical School in 1908 and served his internship at Luther Hospital, St. Paul. From there he went directly into the practice of medicine at Fisher. He served on the staff of Bethesda and St. Francis Hospitals in Crookston, Minnesota, and was a member of the Odd Fellows and Royal Neighbors of Crookston.

Dr. Holland was also a member of the Red River Valley Medical Society, the Minnesota Medical Association, and the American Medical Association.

Survivors include one son, Howard, Fisher; two daughters, Mary (Mrs. Carl Olson), St. Paul, and Evelyn (Mrs. Dow George), Winter Park, Florida.

TIMING OF BIRTHS

More babies actually are born in the "gruesomely early hours of the morning" than at any other time, according to an analysis of more than 33,000 births occurring in five hospitals in three states.

By tabulating the births on an hour-by-hour basis, it was found that more births consistently occurred between 3 a.m. and 11 a.m. than at any other time of the day, and 48 per cent more births took place at the peak hour, 5 a.m., than at the low hour, 7 p.m., Dr. Peter D. King reported on the study in *Science.* Cesarean sections, recond or third babies in multiple births, and mid or high forceps deliveries were excluded from the series.—NOTES AND COMMENTS: *Journal of the American Osteopathic Association,* 55:692 (July) 1956.

President's Letter

THE PRESIDENTIAL ADDRESS

Did you ever sit down on a hot evening in July to write a letter that must be submitted to the state office by the tenth of August so that it can be published in the September issue of a journal—a hot evening when you would much prefer being out on the river in your speed boat, and would be, if said speed boat had not been in dry dock for three weeks, right in the middle of the boating season?

Then add to that another question: "What's the use; who is going to read it anyway?"

Answer those questions and you will know one of the joys of being your president.

Seriously, because it is a hot night, I would like to limit this letter to a suggestion for a change in procedure at our annual meeting, or, more specifically, the program at our annual banquet.

Usually the president of the host society or someone selected from the host society presides, and our annual dinner program in general consists of: (1) Introduction of the president of the Woman's Auxiliary and other honored guests, (2) presentation of Southern Minnesota Medical Association Award, (3) presentation of Fifty Club certificates, (4) presentation of Distinguished Service Medal, (5) presidential address, and (6) the main speaker of the evening.

One reason for suggesting a change is that the program is too long; it is difficult to keep people from getting restless or bored for that length of time.

My second reason for suggesting a change is that it is difficult for the speakers, and probably more difficult for the audience, to have both the presidential address and a featured speaker on the same program. I'm sure most of our audiences get a little impatient with the president's address, because the featured speaker is to follow and the evening is dragging on.

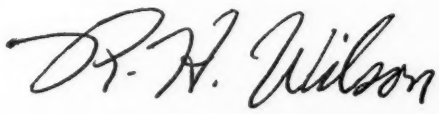
My third reason is that it is difficult for a president to prepare an address that will hold the attention of a mixed audience of physicians and their wives. The physicians expect you to discuss some phase of medicine, either scientific or organizational, as related to your Association. If you do this, the wives are apt to be bored, so the address must be on a rather general phase of medicine if it is to hold the attention of all, and that limits your subject material considerably.

Having gone through an annual meeting and agonized over preparing a presidential address, there can be no ulterior motive in the suggestions I am going to make. The annual meeting and annual dinner is naturally the high spot in any president's term of office, and I feel he should have recognition as the man you have honored by electing him to that office; so my suggestion is this:

First, have your president make his presidential address to the opening session of the House of Delegates. There he would be talking to the representatives of organized medicine, and could confine his remarks to problems of organized medicine, a brief review of problems during the past year, and a summary of problems facing the present House of Delegates. He would have something to talk about that would be purposeful.

Second, have your president preside at the annual dinner, make a few brief introductory remarks, introduce the honored guests, the president-elect, the men who are going to present the awards, and the speaker of the evening.

I feel this would make your president's address of some significance and much easier to prepare, it would give him recognition at your annual dinner, and would definitely shorten the program. May I submit this for consideration by the Council and the next local arrangements committee?



President, Minnesota State Medical Association

Medical Economics

Edited by the
Committee on Medical Economics,
Minnesota State Medical Association
George Earl, M.D., Chairman

PRESIDENT SIGNS SOCIAL SECURITY BILL

The controversial social security bill (H.R. 7225) is now the law of the land. Increased OASI taxes to support payments to the disabled at age fifty become payable January 1, 1957. Disability benefits become payable July 1, 1957. Until and unless new regulations are issued, physicians will follow the same procedure in connection with this new law that they follow under the disability freeze amendment now in effect. The doctor makes his medical findings and turns in his report to the state agency in charge. The decision then is made by the agency, based on vocational as well as medical findings, as to the applicant's disability.

PRESIDENTIAL SIGNATURE COMPLETES ACTION ON OTHER BILLS

Of the more than twenty health measures carried during the past session in the AMA "legislative boxscore," Congress failed to pass only six. Presidential approval completed the enactment of a new law establishing a new mental health program for Alaska and authority for commissioning osteopaths as medical corps officers. Other bills still awaiting White House approval in mid-August were the Little Omnibus Health Bill and the creation of a National Library of Medicine.

The President also signed into law a bill authorizing appointment of Army or Air Force women reserve officers as nurses or women medical specialists in the Army or Air National Guard.

ADMINISTRATION URGES CONSTRUCTION AID TO MEDICAL SCHOOLS

President Eisenhower has criticized Congress for not voting the same type of assistance to medical schools as it has to medical research facilities. He recently signed a bill which provides a three-year federal grants program to help in constructing the research facilities and stressed the need "to extend the assistance to include the laboratories where future health research personnel are being devloped. In medical and dental schools, space for research and teaching functions are so closely inter-related with one another that no clear line can be drawn between them."

NARCOTICS CONTROL BILL PASSES CONGRESS

A bill to provide for a more effective control of narcotic drugs and marihuana passed Congress in July. This new law will strengthen the authority and methods of the Federal Bureau of Narcotics by permitting its agents to carry firearms, to execute and serve search warrants and arrest warrants, and in certain situations to make arrests without warrants. Also penalties for narcotics violators are toughened considerably with a prohibition on the granting of probation, suspension of sentence or parole with respect to any of the increased penalties applicable to traffickers.

The new law also includes a provision creating a specific offense of selling narcotics to individuals under eighteen. Any one *over* eighteen who knowingly sells or gives away any heroin unlawfully imported into the United States to a person who is under eighteen shall be subject to the death penalty if the jury shall so direct.

CABINET STATUS ASKED FOR U. S. CIVIL DEFENSE AGENCY

The next Congress will be asked to pass legislation creating a cabinet rank Department of Civil Defense and to make drastic changes in the entire national civil defense concept. Recommendations appeared in a report by the Holifield House Subcommittee following a year's study. The report was published just at the end of the 84th Congress. The proposed department would merge civil defense work of the Federal Civil Defense Administration and the Office of Defense Mobilization.

ALLOCATION PROGRAM OF SALK VACCINE ENDS

After approximately fifteen months the Federal government has stepped out of the allocation picture for the manufacture, distribution and use of the Salk poliomyelitis vaccine. From now on,

unless an emergency requires reinstitution of the allocation program, distribution will be handled through normal channels. The U. S. Public Health service will still continue to notify states of the amount and the manufacturer when a new supply of vaccine is released and to receive information from manufacturers on the geographic distribution of sales.

$35 MILLION ALLOCATED FOR VOCATIONAL REHABILITATION

The Office of Vocational Rehabilitation announces the allocation to the states of $35 million for programs to help disabled persons overcome handicaps and obtain employment. In addition, another $2 million is available for grants to aid research and demonstration projects and $2.95 million for teaching grants and traineeships to qualify more personnel for work with the handicapped.

SEARS, ROEBUCK FOUNDATION ANNOUNCES LOANS

Assistance in establishing eleven new medical practices through thirteen loans to physicians was announced recently by the Sears, Roebuck Foundation. The loans, ranging from $3,000 to $15,000, were made under the Foundation's recently-established Plan of Assistance and totalled $71,500. One of the loans went to a physician in Northern Minnesota.

Purpose of the plan is to help physicians supplement personal and local financing when this is insufficient, especially in areas with inadequate medical care. The Foundation administers the plan, and screening and selection of applicants is done by a seventeen-member advisory board of physicians nominated by the board of trustees of the American Medical Association.

WEST GERMAN MEDICAL EDUCATION SURVEYED

Dr. J. Mather Pfeiffenberger, Alton, Illinois, and Dr. DeWitt Hendee Smith, Princeton, New Jersey, said after a tour of West German medical schools that teaching methods are changing and there is much construction of new buildings—some of which "would be envied by any medical school." They also found that research was going on not only in the universities but in smaller or remote hospitals, and that there is no attempt to limit the size of medical school classes even in the face of an admitted surplus of doctors. The surplus is mostly accounted for by the immigration from East Germany.

STUDY SHOWS AGED BECOMING LESS DEPENDENT

George Bugbee, president of the Health Information Foundation, believes that despite the increasing numbers of Americans age sixty-five and older, indications are that the aging will become less and less dependent. A recent study points out that although the proportion of older persons among dependents will increase, they will be supported by a working force of larger proportion. Work-life expectancy has increased, and death rates are being reduced through the whole life span, which means that the average family's risk of losing its wage-earner prematurely is also reduced. Also, more women of all ages are working.

FAMILY INCOME BEFORE TAXES UP IN 1955

The average "before-tax" family income in 1955 was three per cent higher than the previous year, the Commerce Department reported recently. Average after-tax family income in 1955 amounted to $4,980, compared with $4,850 in 1954 and $4,380 in 1947.

WOMEN PHYSICIANS OUTNUMBER MEN IN USSR

Russian women doctors outnumber their male colleagues by three to one. Apparent reason: the Soviet need for men in more rugged lines of work.

MEDICINE RANKED MOST DESIRABLE CAREER BY TEEN-AGERS

A Gallup study indicates that U. S. teenage males rank medicine as the most desirable career. Next two in order: science and law.

DOCTORS' FEES STILL BEHIND OVERALL COST OF LIVING

The *Wall Street Journal* reported recently that in spite of increased income, doctors' fees are still behind the overall cost of living. Most doctors are making more money because they are working longer hours and seeing more patients. Very little of the increased income is attributed

to higher fees. In 1956, the cost of all types of medical care is expected to reach $11.8 billion, of which $3 billion will go to physicians. According to the *Journal,* auto-mechanics and repairmen will receive a billion more than doctors. U. S. Bureau of Labor statistics indicate general practitioners' fees have increased by 67 per per since 1939, while surgeons' fees increased only 56.5 per cent. In the same period, the overall cost of living has increased 92.8 per cent.

NUMBER OF SPECIALISTS ON THE RISE

The number of specialists in the United States has increased steadily since 1938. In that year there were 5,688 internists, in 1949 there were 12,079, and this year the number has jumped to 16,321. The number of pediatricians has gone from 2,205 in 1938, to 4,480 in 1949, to 6,567 in 1956. Total number of surgeons in 1938 was 5,397; in 1949, 10,363, and this year, 12,593.

PHYSICIANS CAN DEDUCT FOR REFRESHER COURSES

The U. S. Internal Revenue Service has just issued a regulation which is important to physicians.

Efforts over a long period of time by the AMA Law Department to get the Internal Revenue Service to issue a regulation permitting physicians to deduct their expenditures in taking postgraduate "refresher" courses have finally paid off.

The regulation, effective on August 9, 1956, provides that expenditures for education are deductible if they are for a "refresher" or similar type of course taken to maintain the skills directly and immediately required by the physician in his employment or business. An educational course to be covered should be designed for established medical practitioners to help them keep abreast of current developments in the profession; it should be of short duration; it should not be taken on a continuing basis, and should not carry academic credit. Education designed to prepare the practitioner to enter a specialty will not be acceptable.

When a physician travels away from home primarily to obtain "refresher" education, his expenditures for travel, meals, and lodging while away from home are deductible. However, expenses for personal activities such as sightseeing, social visiting or entertaining, or other recreation will not be allowed.

AMA REVISES PRINCIPLES OF MEDICAL ETHICS

Deferred for final action in Seattle in December is the revision of the Principles of Medical Ethics as reported by the AMA Council on the Constitution and By-Laws, Louis A. Buie, Rochester, chairman. The present principles are comprised of forty-eight sections. The proposed revisions are made up of ten sections. The revised Principles are designed to eliminate in the present code "verbosity and qualifying constructions of dubious value which in themselves engender confusion." The proposed revisions follow. If you have any suggestions relative to these proposed Principles, please send them to the Minnesota State Medical Association office, 496 Lowry Medical Arts Building, St. Paul 2, and they will be passed on to the delegates for discussion at the interim session in December:

Preamble

These principles are intended to serve physicians, individually or collectively, as a guide to ethical conduct. They are not laws; rather, they are standards by which a physician may determine the propriety of his own conduct. They are intended to aid physicians, in their relationships with patients, with colleagues, with members of allied professions and with the public, to maintain under God, as they have through the ages, the highest moral standards.

Section 1.—The prime objective of the medical profession is to render service to humanity with full respect for both the dignity of man and the rights of patients. Physicians must merit the confidence of those entrusted to their care, rendering to each a full measure of service and devotion.

Section 2.—Physicians should strive to improve medical knowledge and skill, and should make available the benefits of their professional attainments.

Section 3.—A physician should not base his practice on an exclusive dogma or a sectarian system, nor should he associate voluntarily with those who indulge in such practices.

Section 4.—The medical profession must be safeguarded against members deficient in moral character and professional competence. Physicians should observe all laws, uphold the dignity and honor of the profession and accept its self-imposed disciplines. They should expose, without hesitation, illegal or unethical conduct of fellow members of the profession.

Section 5.—Except in emergencies, a physician may choose whom he will serve. Having undertaken the care of a patient, the physician may not neglect him. Unless he has been discharged, he may discontinue his

services only after having given adequate notice. He should not solicit patients.

Section 6.—A physician should not dispose of his services under terms or conditions which will interfere with or impair the free and complete exercise of his independent medical judgment and skill or cause deterioration of the quality of medical care.

Section 7.—In the practice of medicine a physician should limit the source of his professional income to medical services actually rendered by him to his patient.

Section 8.—A physician should seek consultation in doubtful or difficult cases, upon request or when it appears that the quality of medical service may be enhanced thereby.

Section 9.—Confidences entrusted to physicians or deficiencies observed in the disposition or character of patients, during the course of medical attendance, should not be revealed except as required by law or unless it becomes necessary in order to protect the health and welfare of the individual or the community.

Section 10.—The responsibilities of the physician extend not only to the individual but also to society and demand his co-operation and participation in activities which have as their objective the improvement of the health and welfare of the individual and the community.

PATIENTS' CODE OF CONDUCT REJECTED

Patients were brought under the microscope of the annual meeting of the British Medical Association in July. It was suggested that an enforceable code of conduct for patients be drawn up and that it be of "a persuasive rather than an obligatory nature printed on the medical cards." After debate, however, the Council of the organization decided not to pursue the idea because it thinks that "a large majority of patients are co-operative, and that such rules would not serve any practical purpose."

Who is primarily affected by the plague of housing decay? As in the case of tuberculosis, it is a plague of the people and not merely an affliction of the health director or his department. We could never expect to control tuberculosis without the understanding cooperation of the public. Tuberculosis services, case-finding programs, hospitals and sanatoria, rehabilitation services, financial aid for the patient and family, and the health department itself exist only because the public believes in them as a means toward success in the struggle against the tubercle bacillus. Health education provides the thread that binds the program together so that failure is denied.—HENRY F. VAUGHAN, Dr. P.H., and *Am. J. Pub. Health*, March, 1956.

NEW PROBLEMS IN THE TUBERCULOSIS FIELD

(Continued from Page 613)

later come in with far-advanced disease. Gastric cutlures might have been found positive earlier, and prompt retreatment might have prevented this tragedy for them.

This development of complacency toward tuberculosis on the part of the public is manifested by a decreasing case-finding program. Very recently six rural counties employed their own epidemiologist, who, with public health nurse assistance in two of the counties, found forty-six active cases which have had antituberculous treatment in the past year. Other more heavily populated counties which have never had as good a program are likely to harbor a similar proportion of active cases of tuberculosis if an all-out effort were made to find them.

If Minnesota really does want a reduced morbidity rate as well as a reduced mortality rate in tuberculosis, there must be an increased awareness that (1) tuberculosis is still infectious, (2) active, moderately advanced and far advanced disease is still present, (3) all patients do not turn negative on the antituberculous drugs in a short time, (4) patients who do not turn negative are infecting others with a potentially resistant organism, (5) many patients do not take the drugs at home as faithfully as would be desirable, (6) patients with tubercle bacilli in their sputum are likely to mingle with the public in spite of their promise to stay away and (7) small nodules and lesions stationary on x-ray can become far-advanced disease and need to be watched with repeated cultures as well as x-rays.

The public health conscience needs to beware lest the remarkable results of the antituberculous drugs exert a tranquilizing side effect which will end in an increase in tuberculosis with loss of time, money and life, and the addition of innumerable social problems.

With the advent of the newer drugs, and the great advance in surgery of the lungs, medical progress has slowly converted tuberculosis from a killing to a chronic disease. This is a great achievement. But, in changing the course from a killing to a chronic state, tuberculosis handicaps its victims, thereby creating a huge financial and emotional problem, which eventually threatens, with its ever increasing size, to stifle the medical economy of our communities.—I. PHILLIPS FROHMAN, M.D., *Ohio State M. J.*, August, 1955.

Meetings and Announcements

MEDICAL MEETINGS

STATE

MINNESOTA STATE MEDICAL ASSOCIATION, 104th annual meeting, Saint Paul, May 13, 14 and 15, 1957.

NATIONAL

American College of Gastroenterology, annual convention, The Roosevelt, New York, New York, October 15-17, 1956. Write American College of Gastroenterology, 33 W. 60th Street, New York 23, New York.

American College of Surgeons, sectional meeting, Hotels Lowry and St. Paul, St. Paul, Minnesota, April 8-10, 1957. Write Dr. H. Prather Saunders, Associate Director, American College of Surgeons, 40 East Erie St., Chicago 11, Illinois.

American Heart Association, 29th annual scientific session, Cincinnati, Ohio, October 26-29. Write American Heart Association, 44 East 23rd Street, New York 10, New York.

Conference on Health in Industry, Center for Continuation Study, University of Minnesota, Minneapolis, Minnesota, October 18-19, 1956.

Diseases of the Chest, 11th annual postgraduate course, Hotel Knickerbocker, Chicago, Illinois, October 15-19.

Diseases of the Chest, ninth annual postgraduate course, Park-Sheraton Hotel, New York, New York, November 12-16.

Centennial Exposition, 100th anniversary of the Academy of Medicine of Cincinnati, Music Hall, Cincinnati, Ohio, February 27-March 5, 1957.

National Society for Crippled Children and Adults, annual convention, Hotel Statler, Washington, D. C., October 28-31.

Interstate Postgraduate Medical Association of North America, Cleveland, Ohio, October 22-25.

San Diego Postgraduate Assembly, San Diego County Hospital, San Diego, California, September 19 and 20. Write Dr. Michael J. Feeney, 3415 Sixth Avenue, San Diego 3, California.

University of Illinois Department of Otolaryngology, Annual Assembly in Otolaryngology, October 1-7. Write Department of Otolaryngology, 1853 West Polk Street, Chicago 12, Illinois.

INTERNATIONAL

Inter-American Congress of Cardiology, Havana, Cuba, November 4-10. Dr. Ramon Aixala, Apartado 2108, Havana, Cuba.

International Cancer Cytology Congress, Chicago, Illinois, October 9-11.

Pan American Congress on Cancer Cytology, Miami, Florida, January 8-12, 1957. Dr. J. Ernest Ayre, chairman, 1155 N. W. 14th St., Miami, Florida.

Pan-Pacific Surgical Association, seventh congress, Honolulu, Hawaii, November 14-22, 1957. Write Dr. F. J. Pinkerton, director-general of the Pan-Pacific Surgical Association, Room 230, Young Building, Honolulu, Hawaii.

World Medical Association, Havana, Cuba, October 9-15. Dr. Louis H. Bauer, secretary general, 345 East 46th St., New York 17, New York.

AMERICAN COLLEGE OF CHEST PHYSICIANS ESSAY CONTEST

The council on undergraduate medical education of the American College of Chest Physicians is offering three cash awards for the best contributions prepared by undergraduate medical students on any phase in the diagnosis and treatment of chest diseases (heart and/or lungs).

First prize for the 1957 contest will be $500; second prize, $300, and third prize, $200.

The winning contributions will be selected by a committee of chest specialists and will be announced at the 23rd annual meeting of the American College of Chest Physicians to be held in New York City, May 29-June 2, 1957. All manuscripts become the property of the college.

Applicants are requested to study the format of *Diseases of the Chest,* the official journal of the college, as to length, form and arrangement of illustrations to guide them in the preparation of the essay. A copy of the journal will be sent upon request. The following conditions must be observed:

1. The completion of an application form, which may be obtained by writing to the Executive Director, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.
2. Five copies of the manuscript typewritten in English (double-spaced) should be submitted to the college offices in Chicago not later than April 10, 1957.
3. The only means of identification of the author shall be a motto or other device on the title page and a sealed envelope bearing the same motto on the outside, enclosing the name and address of the author.

INFERTILITY ESSAY CONTEST

The subject for this year's Caleb Fiske Prize, offered by the Rhode Island Medical Society, is "The Present Day Treatment of Infertility." A cash prize of $350 will be awarded for the best essay on the subject, not over 10,000 words, submitted by January 10, 1957.

For further information write the Secretary, Caleb Fiske Fund, Rhode Island Medical Society, 106 Francis St., Providence 3, Rhode Island.

AMERICAN COLLEGE OF PHYSICIANS

The annual meeting of the Midwest Region of the American College of Physicians will be held in conjunction with the meeting of the Minnesota Society of Internal Medicine in Minneapolis on October 27. The scientific program will be held in the Mayo Memorial Auditorium on the campus of the University of Minnesota Medical School. The sessions will begin at 9:00 a.m. All physicians are invited to attend.

Dr. Wesley W. Spink, professor of medicine at the University of Minnesota Medical School, is general chairman of the meeting.

A course, "Recent Advances in Cardiovascular Diseases," is being held at The Mount Sinai Hospital, New York, October 8-12, 1956, under the auspices of the American College of Physicians. Co-directors will be Dr. Arthur M. Master and Dr. Charles K. Friedberg. Fees for members of the American College of Physicians will be $30.00, non-members, $60.00. Registration should be filed with the Executive Secretary, American College of Physicians, 4200 Pine Street, Philadelphia 4, Pennsylvania.

PSYCHIATRIC AIDE PROGRAM

The Minnesota Department of Welfare is offering a combined program of psychiatric aide and practical nursing education, under a grant from the National Institute of Mental Health. Graduates of the fifteen-month course will be competent to function in psychiatric hospitals, nursing homes and general hospitals. Classes will be held at Gustavus Adolphus College and St. Peter State Hospital, St. Peter, and St. John's Hospital, St. Paul. Total cost of tuition, fees, uniforms and books will be about $225, with board and room furnished free.

The course is open to high school graduates, aged 18 to 50, in good health, with character references, able to meet admission requirements of Gustavus Adolphus College. Classes will start in the fall and spring semesters. For further information write the Director, Psychiatric Aide Training Project, Room 220, 1111 Nicollet Avenue, Minneapolis, Minnesota.

HEART DISEASE PUBLICATION

Of special interest to the internist and other physicians wishing to keep abreast of new developments in the field of cardiovascular disease will be the plans recently announced by the officers of the Minnesota Heart Association.

The monthly publication, *Modern Concepts of Cardiovascular Disease*, which has been available to members of the Heart Association in the past, at an annual fee of $5, will now be sent without charge to any Minnesota physician who writes requesting it.

The contents of this well-written, concise, scientific publication make a useful reference addition to the medical library of the busy physician.

This service is being offered as a part of the Professional Education Program of the Minnesota Heart Association. All physicians are urged to avail themselves of this offer. Requests should be addressed to the Minnesota Heart Association, 1821 University Avenue, Saint Paul 4, Minnesota.

CONTINUATION COURSES

At the center for continuation study, University of Minnesota.

September	25-27, 1956	Pediatrics for Pediatricians
October	18-20, 1956	Techniques in General Practice
October	22-24, 1956	Gynecology for General Physicians
November	5-9, 1956	Radiation Therapy for Radiologists
November	19-21, 1956	Fractures for General Physicians

For further information concerning the above courses, write to the Director, Department of Continuation Medical Education, 1342 Mayo Memorial, University of Minnesota, Minneapolis 14.

GENERAL PRACTICE FALL REFRESHER

The Minnesota Academy of General Practice announces the Sixth Annual Fall Refresher to be held at the Prom Ballroom, St. Paul, October 17, from 8:30 a.m. to 5:30 p.m.

Fourteen lecturers will cover a variety of subjects, and the luncheon speaker will be **Dr. Claude J. Beck**, Cleveland. Also speaking will be **Dr. Michael J. Wohl**, Philadelphia, and **Dr. James L. Dennis**, Oakland, California.

Registration fee, including the luncheon, is $10, and inquiries should be addressed to **Dr. James A. Blake**, 15 Ninth Avenue South, Hopkins, Minnesota.

CRIPPLED CHILDREN SERVICES 1956 FALL CLINIC SCHEDULE

Place	*Date*	*Counties*
Grand Rapids	Sept. 19	No. Aitkin, So. Cass, Itasca
Little Falls	Sept. 22	Mille Lacs, Morrison
Hibbing	Sept. 26	St. Louis, West Range
Winona	Sept. 28	Fillmore, Wabasha, Houston, Winona, Olmsted
Virginia	Oct. 3, 4	St. Louis, East Range
Crookston	Oct. 5	Polk, Norman
Fergus Falls	Oct. 13	Otter Tail, Wilkin
Willmar	Oct. 20	Chippewa, Meeker, Kandiyohi, Renville
Alexandria	Oct. 27	Douglas, Pope, Grant
Mankato	Nov. 3	Blue Earth, Faribault, Waseca, Martin, Watonwan
Sauk Center	Nov. 8	Stearns, West Todd
Anoka	Nov. 13	Anoka, Kanabec, Chisago, Ramsey, Dakota, Sherburne, Hennepin, Wright, Isanti, Washington
Marshall	Nov. 17	Lac qui Parle, Lincoln, Redwood, Lyon, Yellow Medicine

Woman's Auxiliary

NEW PRESIDENT-ELECT PRACTICES WHAT SHE PREACHES

Playing the role of "propagandist in the field of public health, buffer for her husband and an active participant in civic affairs"—these are the primary functions of every doctor's wife, according to the new president-elect of the Woman's Auxiliary to the Minnesota State Medical Association.

Mrs. C. L. Oppegaard, Crookston, practices what she preaches, for she has a wide background of experience in educational and medical fields to qualify her as the future top officer of the organization. She comes from a medical family; her father is a doctor; her brother and sister are practicing physicians and two brothers-in-law were doctors.

Mrs. Oppegaard graduated from Carleton College, Northfield, Minnesota, with a major in chemistry and taught school in Crookston before her marriage.

Active in many local organizations, she has been a vice-president of the WSCS of her church, president of the Crookston AAUW, child welfare chairman of the Crookston Legion Auxiliary, a member of the PTA, has worked with the Campfire Girls and as a Red Cross Nurse's Aide during World War II.

Her interest in medical affairs is reflected in her activities with various tuberculosis organizations. She is currently president of the Polk County Tuberculosis and Health Association, is secretary of the State Executive Committee and a member of the governing council of the Mississippi Valley Tuberculosis Association.

Mrs. Oppegaard traces her Auxiliary work back to 1926 when she first joined the Red River Valley Medical group. She has served as its president and in many other capacities. Her Auxiliary embraces nine counties and the members are scattered so that keeping them informed is a major project. This Red River Valley group encourages members to keep informed on legislative problems affecting their husbands' work and urges participation in local groups where they can promote problems of health.

When they have a program to prepare for the PTA, Legion Auxiliary or church, members are urged to use films and available qualified personnel. Money remaining in the treasury at the end of the year is given to the AMEF. This year the Red River Valley group, under the leadership of Mrs. John Cameron, is concentrating on home nursing and other civil defense projects, stressing discussion of local problems as well as those of the National Auxiliary.

Locally, Mrs. Oppegaard has participated in the various activities of the Crookston Auxiliary. Each year this group organizes all the local help and furnishes lunches for personnel and patients of the annual orthopedic clinic. This project was started twenty-five years ago. Mrs. J. F. Norman was first chairman, then Mrs. Oppegaard, followed by Mrs. R. O. Sather, Mrs. Cameron and Mrs. S. H. Hirsch.

These many civic affairs tie in with Mrs. Oppegaard's philosophy on Auxiliary work: "To aid greatly in protecting the present form of medical practice and informing others contacted in other fields." She believes that instruction to "promote medical public relation" can come from membership in the Woman's Auxiliary.

GEORGE GRIM TO SPEAK AT SCHOOL OF INSTRUCTION

Popular *Minneapolis Tribune* columnist, George Grim, will be featured speaker at the annual Woman's Auxiliary School of Instruction for all state and county officers, committee chairmen and board members, Tuesday, October 9, at the Curtis Hotel, Minneapolis. Grim will give his impressions of medical practice and medical facilities as he observed them during his recent tour of Russia.

The October 9 "school day" will stress more effective program planning for county meetings and will stress accelerated support of the three major Auxiliary projects: TODAY'S HEALTH, AMEF, and recruitment in allied fields of medicine. A series of talks has been arranged to describe and even demonstrate how programs are put together and where to look for material. Questions and comment will be invited.

There will also be a talk on legislative matters and a new public relations film, "The Case of the Doubting Doctor," if it is released in time by the AMA.

Auxiliary President Mrs. L. P. Howell, Rochester, and President-elect, Mrs. C. L. Oppegaard, Crookston, will report on the national conference they will attend in Chicago, October 1-3.

Registration for the School of Instruction, to which all interested Auxiliary members are invited, will be at 9 a.m., October 9, at the Curtis Hotel.

Although the new drugs are a most helpful addition to our armamentarium, they are not a substitute for the tedious but progressively successful tuberculosis control program developed painstakingly over the last half century which will lead eventually to our goal of eliminating all tuberculous infections, in other words, to the goal of no reactors to the tuberculin test.—JAMES E. PERKINS, M.D., Managing Director, NTA, *Journal-Lancet,* April, 1956.

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Physicians and organized medicine are rightfully if a little tardily assuming a more active role in health education. Health forums sponsored by local medical societies have served a most useful purpose, including the demonstration that the physicians of a community can work together and pool their efforts in a common cause. Hospitals need to take a more active part in health education for patients, and on a community basis, jointly with physicians and health officers.—L. E. BURNEY, M.D., *California Medicine,* January, 1956.